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Platers to Meet in Chicago

The Twenty-First Annual Convention of the American Electro-Platers' Society Will Be Held on June 27-30, 1933, in Chicago, Illinois. Headquarters, Congress Hotel

By C. S. TOMPKINS

General Secretary, 1933 Convention Committee

THE American Electro-Platers' Society was organized in 1909 and dedicated to study and research in the art of the electrodeposition of metals. It is devoted to educational work. Its membership is composed of executives in plating departments, chemical engineers, foreman platers and professors of chemistry.

The Society maintains a man at the United States Bureau of Standards, Chemical Division in Washington, D. C., whose entire time is devoted to research in electroplating.

The Society has a Research Committee under whose direction many tests are being carried on to determine the wearing and rust resisting qualities of different combinations of electrodeposited metals. This committee has accomplished a great deal in the past year and never has there been a time when it was so important to the plater, the chemical engineer and the manufacturer to carry on this work.

At this Convention the results of the research work done by the Bureau of Standards at Washington, D. C., and the findings of the tests conducted by the Research Committee will be told in detail. These results, based on facts learned from experience, are invaluable to everyone in the industry.

C. A. VAN DERAU
President

H. A. GILBERTSON
Secretary-Treasurer

W. J. A. KENNEDY
Editor of The Review

Papers To Be Read

The Educational Sessions which are open to all who register at the Convention, will include the **most practical papers** ever presented at any Convention of the Society. O. E. Servis, Librarian of the Chicago Branch, and Chairman of the Convention Educational Committee, has booked some outstanding authorities who will present papers and discussions of the most vital problems confronting us today. Some of the titles and authors are given below:

"The A. E. S., its Ideal and Aspirations" by Charles H. Proctor, Founder of the Society.

"Faraday, Electro Plating in His Time and Today" by Geo. B. Hogaboom, Research Engineer.

"Summary of Research Work at the Bureau of Standards" by Dr. William Blum, Bachelor of Science.

"A Century of Progress in Nickel Deposition" by William M. Phillips, Research Department, General Motors Corporation.

"Impurities in Nickel Solutions" by F. J. Liscomb, Research Engineer.

"Factors Contributing Toward Quality in Plated Zinc Die Castings," by Carl Hussner, Chrysler Motors Corporation.

"A Plater's Qualifications" by C. E. Van Derau, Plating Engineer, Westinghouse Electric & Manufacturing Company, Mansfield, Ohio.

"Cadmium Plating on Full Automatic Machine" by F. L. Greenwald, Plating Engineer, W. C. Grunow Corporation.

"Notes on Stray Currents in Plating Baths" by Gustaf Soderberg, Udylite Process Company.

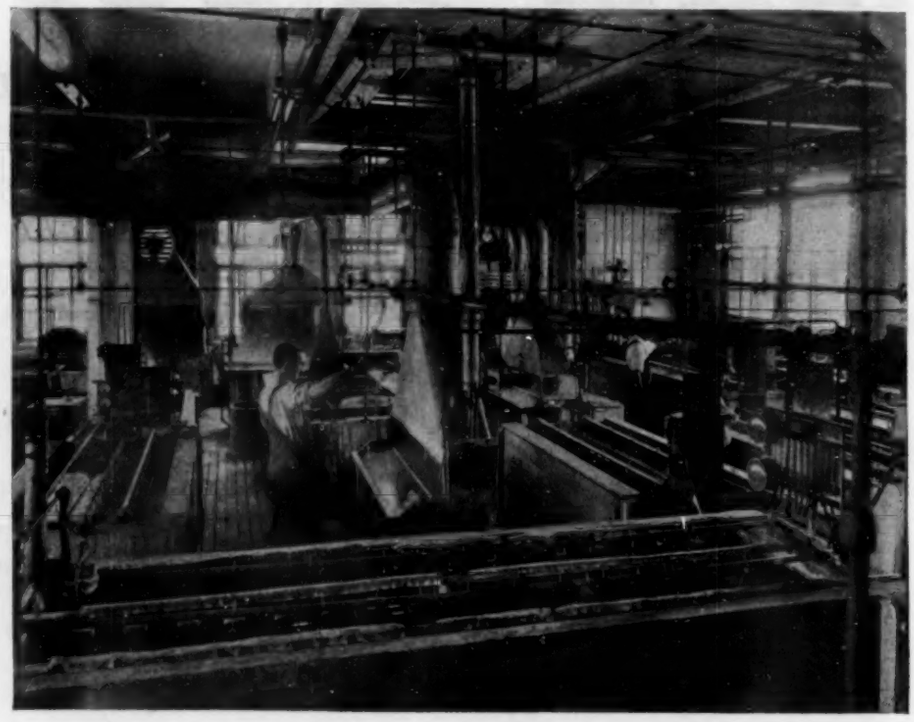
"Notes on the Analysis of Tin Plating Solutions" by M. R. Thompson, Bureau of Standards.

"The Use of Acids in Preparing Steel for Plating" by Walter Barrows, Toronto Branch.

"Practical Methods for Cleaning Before Plating" by C. E. Clindinin, Chief Chemist, General Spring & Bumper Corporation.

"Modern Etching and Coloring Methods" by G. H. Mamerow, Crowe Name Plate & Manufacturing Company.

"Exposure and Accelerated Tests of Plated Coatings" by P. W. C. Strausser, A. E. S. Research Associate, Bureau of Standards.



Plating Department, Felt and Tarrant (Comptometers), Chicago, Ill.

"Some Problems in Technical Control of Nickel Plating Production" by F. A. Maurer, Edison General Electric Company, Ontario, Calif.

"Microscopic Measurement of Copper and Nickel Plate Thickness on Steel, Brass and Zinc Die Castings" by Fred Carl, Guide Motor Lamp Company, Anderson, Ind.

"Methods of Stripping Plated Coatings" by A. Brenner, Bureau of Standards.

"Spray Prevention by the Use of Fixed Oils in Chromium Plating" by Prof. F. C. Mathers, University of Indiana.

From the above it is plainly evident that the Educational Sessions will be of the most practical value to all who attend.

Century of Progress Exposition

In addition to the above educational advantages, we are extremely fortunate in holding this Convention at a time when the Century of Progress International Exposition is creating world-wide interest. The occasion of this great Exposition is the Centennial of Chicago, and its purpose is to tell by easy stages and in simple form, the story of scientific discoveries and inventions based on those discoveries, their application to industry and the resultant transformation that has made the world of today so different from the world of a century ago.

The grounds upon which the Exposition is held was once fathoms under the surface of Lake Michigan and extends three and one-half miles along the Lake front. It is within easy walking distance of Chicago's downtown district.

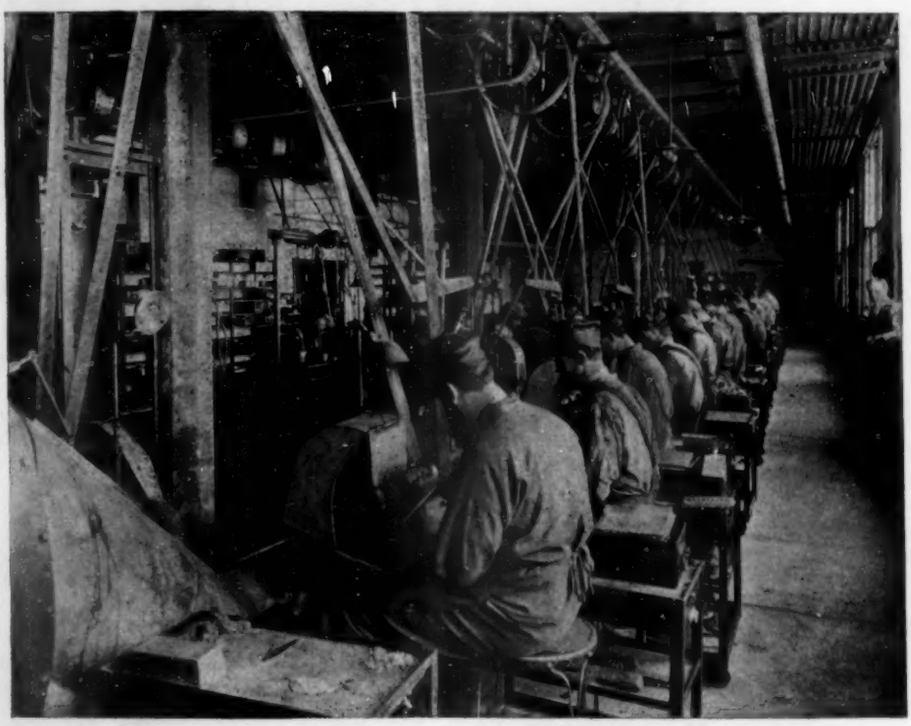
The Convention Program is arranged for an afternoon

and evening at the Fair with one other afternoon optional.

The dates for the Convention were selected so that one might leave home on Saturday, June 24 by train, bus or auto and reach Chicago in time for the opening session, Tuesday. July Fourth falls on the following Tuesday and this allows time to see more of the Exposition after the closing of the Convention, and reach home on July 5th.

Manufacturing in Chicago

Chicago offers many plants of interest, industrially: Stewart-Warner Corporation, manufacturers of auto accessories and radios; A. & J. Kitchen Tool Company, who make a very large line of kitchen utensils; W. C. Grunow, Inc., the Grunow Refrigerator, the Grigsby-Grunow Corporation, Majestic radios and refrigerators; General Spring & Bumper Corporation, automobile bumpers; O. D. Jenkins Company, slot machines; Felt & Tarrant. comptometers; Sloan Valve Company; Junior Toy Company; Chicago Roller Skate Company; Edison General Electric Appliance Company; Chicago Flexible Shaft Company; Dole Valve Company; Chicago Spring Hinge Company; Crane Company; Wilson-Western Sporting Goods; Automatic Electric Company; Crowe Name Plate & Manufacturing Company; Pullman Car Company; Wahl Fountain Pens; Hurley Machine Company, washing and ironing machines; Liquid Carbonic Company; F. H. Noble Company; Western Electric Company, and many others in addition to over a hundred job plating shops.



Polishing Department, Felt and Tarrant (Comptometers), Chicago, Ill.

Convention Program

The Program of the Convention offers many features for the guests' entertainment as well as enlightenment.

Tuesday, June 27:

8 A. M.—Registration.
10 A. M.—Opening Session of Convention
2 P. M.—Educational Session.
Evening—Boat Ride along Chicago's beautiful Shore Line. This trip will afford a wonderful view of the Exposition grounds from Lake Michigan at night with spectacular illuminating effects, transforming the lake front into a multi-colored panorama of light. Dancing on the boat.

Wednesday, June 28:

9 A. M.—Educational Session.
Afternoon—Visit to the Century of Progress Exposition and Fort Dearborn.
Evening—This trip will be individual and not collective, giving all a chance to see points of their own choice. Additional ticket for Planetarium visit

Thursday, June 29:

9 A. M.—Educational Session.
2 P. M.—Business Session.
7 P. M.—Annual Banquet. Entertainment and dancing. Informal.

Friday, June 30:

9 to 11 A. M.—Educational Session.
11 to 1 P. M.—Business Session.
P. M.—Optional auto sight seeing trip around Chicago's park and boulevard system, or another afternoon at the Fair, or a trip to the Stock Yards.
Evening—Farewells.

For the Ladies

Tuesday, June 27:

A. M.—Registration.
P. M.—Trip through Merchandise Mart and National Broadcasting Company Studios.
Evening—Boat ride with entertainment and dancing.

Wednesday, June 28:

Afternoon and evening at the Century of Progress.

Thursday, June 29:

Trip through Marshall Field Store with luncheon

7 P. M.—Annual Banquet. Entertainment and dancing. Informal.

Friday, June 30:

Optional auto sight seeing trip, or afternoon at the Exposition, or a trip to the Stock Yards.

The registration fee for men is $8.00. This includes all Educational Sessions, boat ride, afternoon and evening at the Exposition, Old Fort Dearborn, auto sight seeing trip, or optional, one extra afternoon at the Exposition, or Stock Yards trip, Planetarium lecture and banquet.

The registration fee for the ladies is $6.00. This includes trip through the Merchandise Mart and National Broadcasting Company Studios, boat trip, afternoon and evening at the Fair, trip through Marshall Field's with luncheon, Planetarium lecture, optional auto sight seeing trip or another half day at the Fair, or a trip through the Stock Yards.

The Convention is not being conducted for profit. You will receive value in excess of what you pay.

There are many conventions to be held in Chicago during the time selected for our meeting and we are going to ask all who possibly can to make the Congress Hotel their home during the A. E. S. Convention, so that we may be all together.

The Convention Committee has worked hard to make your visit to Chicago a profitable one. F. J. Hanlon, General Chairman, has spared no effort or time to make the 1933 Convention the best ever held by the Society. The Chairmen of the different Committees have been devoted to their work and harmony has prevailed. It's up to you to make it the "biggest," the Chicago Branch has done its part to make it the "best."

Manufacturers having plating foremen cannot afford to miss this opportunity to have a representative present.

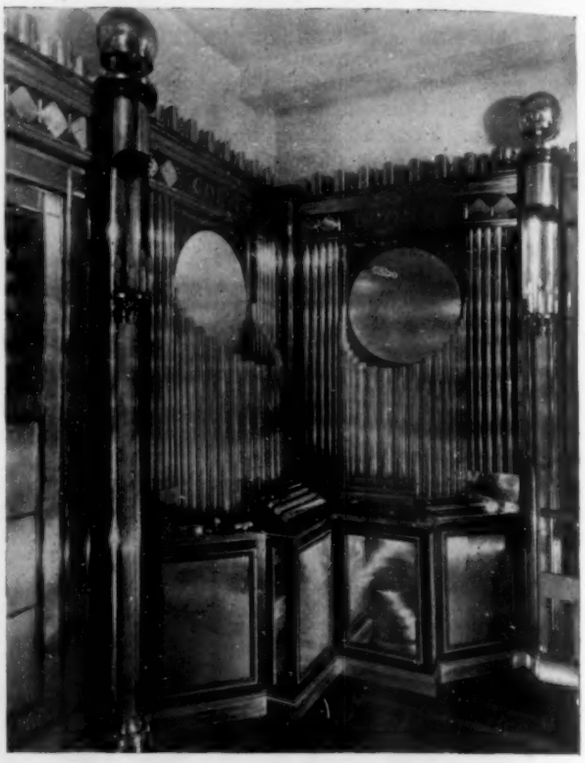
International Fellowship Club

At the request of the Chicago Convention Committee the International Fellowship Club did not arrange for their annual Open House, which is usually held on the first night of the Convention. The Chicago Branch had already arranged for very attractive entertainment, all of which is included in their program.

The Fellowship Club will hold its Annual Meeting during the Convention. The time and place will be arranged after the arrival of the member. It is expected that the Club will be active at the Convention, but no definite arrangements can be made until they are positive that their plans will not interfere with the Convention program. Complete information of Fellowship affairs will be announced at the meetings.

Special Transportation

Members of the American Electroplaters' Society in the East, together with the International Fellowship Club, arranging special transportation rates. The details are in charge of Thomas A. Trumbour, secretary of the Fellowship Club, 57 Buena Vista Avenue, Hawthorne, N. J. Mr. Trumbour has under consideration an offer from the Lackawanna R. R., which will supply a special coach from New York to Chicago at a rate which would make the individual fares, New York to Chicago round trip, $23.05. Connections can also be arranged for those desiring to make reservations from the Philadelphia, Rochester, Buffalo and New England territories.



A Section of the Exhibit of the Copper and Brass Research Association at the Century of Progress Exposition.

Figuring five days in Chicago at $6 a day for meals and room, and $8 for the Convention Registration Fee (which includes a number of admissions to the Century of Progress), it is estimated that total essential expenses will be about $61. Families and friends of members of either the Fellowship Club or the A. E. S. may avail themselves of this plan, and a number have already signified their willingness to do so. All who are interested should communicate at once with Mr. Trumbour, stating how many reservations they will require.

Blisters on Nickel Electrotypes

Q.—Can you tell us what causes blisters on nickel-type electros? We deposit about two thousand nickel and about eight thousand copper. Sometimes when shell is backed up with the base metal, blisters appear; that is, the nickel shell and the copper shell separate in spots.

Our tank holds 320 gallons solution, made up of 180 lbs. single salts; 15 lbs. sal ammoniac. The pH is 6.0. We keep the temperature 95° F.

A.—It is quite probable that you do not have the current on when the nickel shell is put into the copper solution; or if it is on immediately, sufficient current is not flowing to cover the whole surface with copper. In a copper solution where the acid content is as high as that in electrotyping, nickel will receive a chemical coating of copper when there is no current flowing. This copper coating is not adherent and if a shell of copper is electrodeposited over it, the latter will peel.

Rinse the work well in clean water and have the current on when putting the shell into the copper solution. See that the copper is deposited immediately and there will be no separation. G. B. H.

A Further Study of Anodes for Zinc Plating

By Dr. A. K. GRAHAM, G. B. HOGABOOM, Jr. and L. E. GRAHAM

Dr. A. K. Graham and Mr. Hogaboom are With the John Harrison Laboratory of Chemistry, University of Pennsylvania, Philadelphia, Pa. L. E. Graham is Chemical Engineer, J. Meyer & Son, Philadelphia, Pa.

A Further Comparison of the Aluminum-Mercury-Zinc, Mercury-Zinc and Pure Zinc Anodes in a Cyanide Zinc Solution at Current Densities of 15 to 30 Amp. per Sq. Ft. (1.6-3.2 amp. per Sq. Dm.) and Temperatures of 70° F. and 120° F. (21° C. and 49° C.). The Anode and Cathode Efficiencies, Anode Polarization, Sludging Tendency, and Solution Maintenance Were Studied. The Aluminum-Mercury-Zinc Anode Is Considered Superior to the Other Two.

Introduction

IN a recent paper on anodes for zinc plating,[1] alloys of aluminum-zinc, mercury-zinc and aluminum-mercury-zinc were compared with commercially pure zinc anodes in both acid and cyanide zinc plating baths. A zinc anode containing 0.5 per cent aluminum and 0.3 per cent mercury was found to have superior properties, but the conclusions with respect to the cyanide plating bath were based upon data obtained at current densities not exceeding 15 amperes per sq. ft. (1.6 amp. per sq. dm.) and at room temperature. In view of the fact that higher current densities and temperature are frequently employed in practice, it was decided to conduct a further study of these anodes in the cyanide bath, varying both the current density and temperature.

Experimental Conditions

Three glass battery jars in which 1.2 gallons (4.5 liters) of solution could conveniently be employed, were placed in a 27 gallon (100 liter) rectangular, galvanized-iron tank upon wooden supports to raise them several inches from the bottom. The galvanized tank rested upon two large electrically heated hot plates and was used as a water bath. A large motor driven propeller was placed in the water bath and with this assembly it was possible to maintain the higher plating bath temperature of 120° F (49° C) with no temperature variation within the water bath itself and a temperature control within ±1.8°F (1°C).

Lead storage batteries and the necessary ammeter, voltmeter and rheostat gave a steady and readily controlled value of current.

Commercial chemicals were employed in preparing a stock solution of the cyanide plating bath in sufficient amount so that a fresh quantity could be used at the start of each run. The bath composition was the same as that mentioned in the previous study and consisted of the following:

Cyanide Zinc Plating Bath

	Oz/gal.	g/l.
Cyanide Zinc ($Zn(CN)_2$)	8	60
Sodium Cyanide (NaCN)	3	22.5
Sodium Hydroxide (NaOH)	7	52.7

Anodes of commercially pure zinc, mercury-zinc and aluminum-mercury zinc of the approximate composition recorded in table I were prepared from pure aluminum, purified mercury and high purity zinc. A high frequency induction furnace was used in their preparation and a sufficient amount of each alloy was prepared in one heat to permit casting at one time, thus insuring uniform anode composition.

Table I.—Approximate Anode Composition—Percent

	A	B	C
Zinc	100	99.5	99.0
Mercury	...	0.5	0.5
Aluminum	...	...	0.5

Each anode was 6 inches (15 cm.) in length and elliptical in cross section with a major axis of 1 inch (2.5 cm.). When immersed to a depth of 5 inches (12.5 cm.) in the bath the plating area equalled 0.1 sq. ft. (93 sq. cm.). Anode hooks of heavy copper wire were attached by drilling and soldering.

Three jars, one for each anode, were connected in series with one anode placed midway between two cold rolled steel cathodes. The distance between electrodes was about 4 inches (10.2 cm.). The cathodes were stopped off on the side adjacent to the glass jar so that the active plating area equalled that of the anode which was 0.1 sq. ft. (93 sq. cm.).

Three runs were conducted at room temperature at 15, 20 and 25 amp. per sq. ft. (1.6, 2.2, 2.7 amp. per sq. dm.) and four runs at a temperature of 120°F (49°C) and current densities of 15, 20, 25 and 30 amp. per sq. ft. (1.6, 2.2, 2.7 and 3.2 amp. per sq. dm.) respectively. The time of runs varied from 22 to 47 hours depending on the temperature and current density employed. For each run the anode polarization (at the end), efficiency at both electrodes and variation in bath composition were determined.

A saturated potassium chloride-calomel half cell was used in making the polarization measurement as a comparison electrode by the method employed by Sand.[2]

Discussion of Results—Current Efficiencies

The experimental data recorded in Table II show that

[1] The Electrochem. Soc., Vol. 62, p. 283 (1932).
[2] Jour. Chem. Soc., Vol. 91, p. 374 (1907).

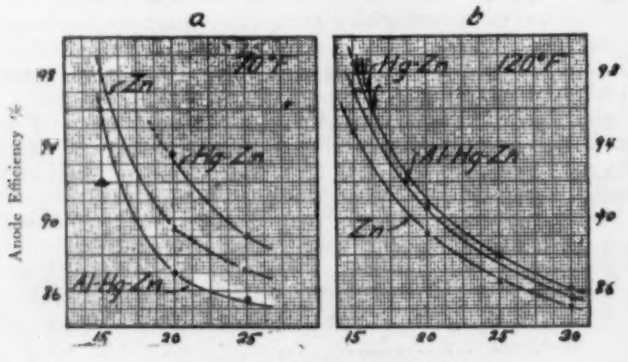
Table II.—Comparison of Zinc Anodes in a Zinc Cyanide Bath at Different Temperatures and Current Densities.*

Temp. of Bath of		Current Density amps. per sq. ft.	Current Efficiency—Percent: Anode Zn %	Anode Hg-Zn %	Anode Al-Hg Zn %	Cathode Zn %	Cathode Hg-Zn %	Cathode Al-Hg Zn %	Anode Polarization Zn Volts	Anode Polarization Hg-Zn Volts	Anode Polarization Al-Hg Zn Volts
70	....	15	98.2	92.9	96.1	98.8	98.5	99.2	3.03	3.02	2.88
70	....	20	89.5	93.6	87.0	98.3	98.2	98.0	2.97	2.87	2.87
70	....	25	87.3	89.1	85.7	98.1	98.7	98.4	3.06	3.03	2.89
120	....	15	94.8	98.7	96.5	98.7	98.9	99.0	3.07	3.07	2.82
120	....	20	89.1	90.8	90.8	98.8	99.0	99.0	3.13	3.14	2.86
120	....	25	86.5	88.0	85.0	98.5	99.1	98.5	3.08	3.02	2.90
120	....	30	85.2	86.2	85.6	98.9	98.6	98.9	3.13	3.11	2.90

* Duration of runs from 22 to 47 hours.

values of anode efficiency for any anode decrease as the current density increases. Raising the current from 15 to 25 amp. per sq. ft. (1.6 to 2.7 amp. per sq. dm.) lowers the anode efficiency by about 10 points in either cold or warm solutions. This becomes more apparent on referring to the curves of anode efficiency versus current density in Figures 1 and 2.

The anode efficiencies for any current density vary with the composition of the anode and the temperature



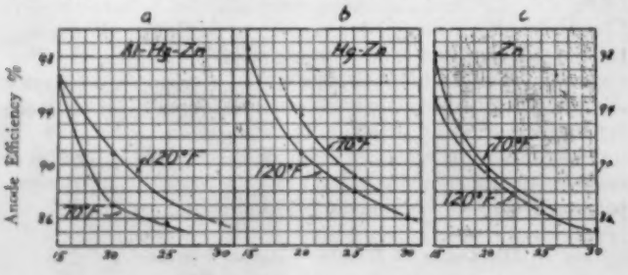
Current Density—Amp. per Sq. Ft.

Fig. 1. Curves of Anode Efficiency Vs. Current Density. Zn $(CN)_2$ Baths

of the bath. With the cold solution (Figure 1a) aluminum-mercury-zinc has the lowest efficiency at any current density, commercially pure zinc is somewhat higher, and mercury-zinc has the highest efficiency with the exception of the apparently irregular point at 15 amp. per sq. ft. (1.6 amp. per sq. dm.). A true appraisal of these values cannot be made, however, without considering the sludge forming characteristics of the anodes.

In the warm solution (Figure 1b) the anode efficiencies of all three anodes are practically the same at any one current density.

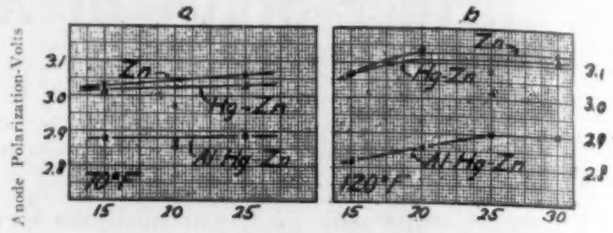
The effect of temperature on the efficiency of any one anode is interesting. The efficiency of the aluminum-mercury-zinc anode (Figure 2a) is the same at the higher



Current Density—Amp. per Sq. Ft.

Fig. 2. Effect of Temperature on the Anode Efficiency-Current Density Curves. Zn $(CN)_2$ Baths

and lower values of current density in either the cold or warm solution. At intermediate values of current density the efficiency in the cold solution is somewhat lower than in the warm solution. The efficiency of the mercury-zinc anode (Figure 2b) is somewhat lower in the warm solu-



Current Density—Amp. per Sq. Ft.

Fig. 3. Curves of Anode Polarization Vs. Current Density. Zn $(CN)_2$ Baths

tion than in the cold one. The efficiency of the pure zinc anode (Figure 2c) is about the same at either temperature.

The cathode efficiencies (Table II) for all three anodes were between 98 and 99.2 per cent, the values being more constant with the warm solution.

The character of the 22 to 47 hour deposits varied with the sludging tendency of the anodes, the edges being particularly rough with the pure zinc anode.

Anode Polarization and Sludge Formation

The values of anode polarization recorded in Table II and Figures 3a and 3b were measured at the end of the runs. The polarization of the aluminum-mercury-zinc anode is practically constant at 2.9 volts in both cold and warm solutions for all current densities studied. The mercury-zinc and pure zinc anodes give values of about 3.0 and 3.1 volts in the cold and warm solutions respectively, and vary but little with current density.

It is important to note that he above values were obobtained at the end of long periods of continuous plating. Polarization measurements taken shortly after starting to plate are usually low, i.e., less than 0.1 volt, and the time required for anodes of different composition to attain their higher values will vary. The bath voltage with the aluminum-mercury-zinc anode when plating at 20 amp. per sq. ft. (2.2 amp. per sq. dm.) and 120° F (49° C) suddenly rose from 0.68 to 3.13 volts after 60 minutes. Under the same plating conditions, using the mercury zinc anode, the voltage suddenly rose from 0.76 to 3.95 volts after about 120 minutes and with the pure zinc anode the voltage rose from 0.68 to 3.7 volts after about 90 minutes. The increase in bath voltages was due entirely to the increase in anode polarization with time of plating as the current density and resistance of the solution were constant and the cathode polarization in all three cases was under 0.15 volt.

Interrupting the current for a few minutes causes the film to drop from both the mercury zinc and pure zinc anodes, but the invisible film on the aluminum-mercury-zince anode is adherent. Upon resuming plating the latter anode will therefore resume its higher polarization value in a few minutes, while the other anodes require a somewhat longer period of time before the heavy anode film is again formed and their higher values of polarization are established.

Most plating is carried on in still tanks operating in batch fashion. This intermittent operation, using aluminum-mercury-zinc anodes, would be carried on (after the first hour) at a constant anode polarization of about 2.9

volts, and without sludging. The other two anodes would give a variable polarization. While their average polarization for the entire day might be somewhat less than the value for the aluminum-mercury-zinc anode, the attention required to adjust the bath voltage in order to maintain a constant current density, and the excessive sludging resulting from current interruptions, must be regarded as serious disadvantages.

With semi or full automatic equipment, the plating is usually continuous throughout the day. Under this condition the mercury zinc and pure zinc anode will produce less sludge than in intermittent plating and the polarization will be about 3.0 to 3.1 volts. The aluminum-mercury-zinc anode will still give a constant polarization of about 2.9 volts and will be sludge free.

Solution Maintenance

The solutions used with each individual anode were analyzed before and after the runs. The variations in the concentration of the constituents present were too small to indicate any significant difference with respect to the current density, temperature, or anode composition.

Conclusions

The conclusions reached in the previous study with the cyanide bath may be amplified as follows:

1. The aluminum-mercury-zinc anode is sludge free. In cold or warm bath at current densities from 15 to 30 amp. per sq. ft. (1.6 to 3.2 amp. per sq. dm.) the anode polarization is practically constant at 2.9 volts.

2. The mercury-zinc and pure zinc anodes produce sludge; the amount being greater in intermittent plating than in continuous plating. The polarization of either anode will vary greatly with intermittent plating, but with continuous plating it will be fairly steady at 3.0 to 3.1 volts.

3. The efficiencies of all three anodes are only slightly affected by temperature and variations in anode composition. As the current density is increased from 15 to 30 amp. per sq. ft. (1.6 to 3.2 amp. per sq. dm.) all three anode efficiencies decrease.

4. The cathode efficiency is not affected by current density and temperature within the limits employed.

5. The roughness of the deposit varies with the sludging tendency of the anode.

6. Under the conditions of test no difference in solution maintenance was apparent with the three anodes.

7. The aluminum-mercury-zinc anode is considered superior to the other two.

Acknowledgment

The authors wish to thank the Hanson-Van Winkle-Munning Company for the chemicals and metal which they furnished for this study.

Electroplating Generators

BY CHARLES J. SCHWARTZ

St. Louis, Mo.

A Series of Articles on the "Cornerstone of the Plating Plant"

THE world has moved since Woolrich built the first magnetic machine that ever deposited silver on a practical scale, in 1844, but the generator still remains the cornerstone of the electrodepositing plant.

The improvements in the low voltage generator, steady as they have been, did not keep pace with the improvements in higher voltage electric machines until the automotive industry and chromium gave the necessary impetus, creating a demand for better and larger generators.

Naturally, the low voltage generator must be hardy and rugged; it will stand for almost any kind of punishment at the hands of its designers and manufacturers, as well as from those who operate it. Because of these admirable traits, because it will plate with only two segments in the commutator even in a multipolar machine, plate when sparking, plate when dirty, plate when hot, etc., it has passed through some very interesting, if not fantastic shapes in its process of evolution. No doubt there are a number of platers' supply house catalogues still in use that give a long list of cures for sparking.

Today a direct current generator that sparks is an anachronism. The commutating pole has quietly assumed its place and its role so that we naturally expect a generator to run sparklessly at any voltage from zero to the maximum it can produce, and at any ampere load from zero to 25% over its rating. The demand for large motor-generator sets brought the demand for high efficiency with surprising results. Chromium called for and received regulating qualities not thought of until its advent.

These and many other facts are well known to the large majority of those engaged in the electrodeposition industry. There are, however, a number of questions on which there may be some confusion and it is the purpose of these short articles to clarify them for the benefit of those interested. While some of these questions may be debatable, the writer's views on them may prove useful if only by bringing out contrary opinions.

The market offers today low voltage generators and motor-generator sets that I shall divide roughly into three classes: (1) slow speed; (2) moderate or high speed; (3) used equipment.

The next installment will discuss these three classes in a general way.

Foundrymen to Meet in Chicago

American Foundrymen's Association Will Hold Sessions and Exhibits at the Hotel Stevens, June 20-23. Many Sessions Are of Special Interest to Non-Ferrous Industries

THE theme of the Century of Progress Exhibition in Chicago, Ill., is the advancement and progress of science and industry during the past century. It was opened on June 1st as scheduled, by light impulses from the star Arcturus. Every foot of exhibit and concession space is under contract and at least 50,000,000 people are confidently expected to attend the Fair.

The weeks of June 19 and 26 have been designated as Science and Engineering Weeks. Thirty-nine societies affiliated or allied with the American Association for the Advancement of Science, with a total membership in excess of 100,000, will hold their annual meetings and conventions during these two weeks.

Committees representing all these groups are cooperating in developing a program of activities. Into this program will be fitted the 1933 Convention and Exposition of the American Foundrymen's Association, to be held June 20-23 at the Stevens Hotel, Chicago. Never was such a setting offered for presenting a program setting forth the advancements in the science of metal casting—and the A. F. A., realizing the importance of the occasion, will present a program of unusual merit.

Every effort is being made for a Foundry Week of continuous, interesting activity. Sessions are planned to offer a maximum of valuable information, especially through informal discussion. Attention is focused on the problems, practices and products of **today**, so that users will be thoroughly equipped in their choice of materials for mechanical requirements. With definite time limits on all meetings, there will be ample time to inspect the A. F. A. Foundry and Industrial Exposition and visit Chicago's great Century of Progress Exhibit and Fair.

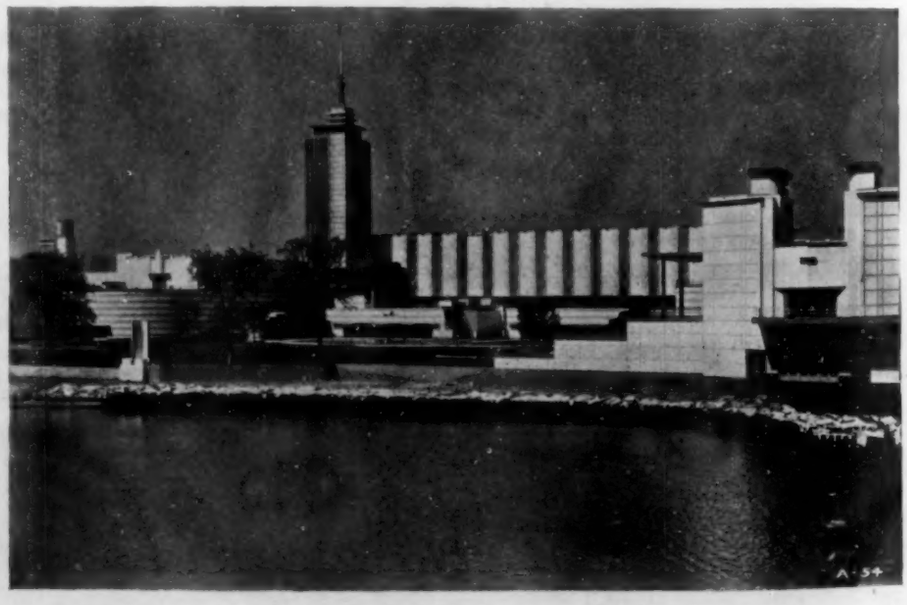
A. F. A. Convention to Present Well-Rounded Picture of Modern Foundry Practice and Products

New cast products and their application in industry, alloys for improving them, methods of castings production, and problems of the foundry industry today—these are subjects to be stressed at the Annual Convention of the American Foundrymen's Association. The entire program has been prepared to give a complete picture of developments of the industry, and to give it to visiting foundrymen in practical, understandable form.

Authoritative papers and reports will furnish evidence of the fact that research in foundry practice and products has been going forward constantly. In addition, the latest improvements in materials and equipment for castings plants will be displayed at the Foundry and Industrial Exposition, in the Exhibition Hall of the Stevens Hotel.

Foundry Sand Control Course

Broad interest is expected in the four-session shop-operation course on practical foundry sand control. This course is a continuation of similar events held at past



The Hall of Science of A Century of Progress. This structure is 700 by 400 feet, shaped like a U, and encloses on three sides a court capable of accommodating 80,000 persons.

Courtesy, Copper & Brass Research Association.

A. F. A. conventions and have proven extremely popular and instructive. The schedule for the 1933 sand course follows:

1st session—Application of sand control to continuous and jobbing foundries. (Principles of control and relation to lowering final cost and increasing quality of castings.)

2nd session—Classification of foundry sand. (Molding sand from standpoint of both producer and consumer; characteristics and particular uses of various types of sand.)

3rd session—Sand defects. (Cause and remedy, and improvement of surface qualities of castings.)

4th session—Core sand. (Sand problems as applied to all types of foundries.)

Nonferrous Round Table

The nonferrous round table, a Foundry Week feature, will have a program unusually interesting and helpful to the average foundryman. The committee in charge is under the able direction of H. M. St. John, Detroit Lubricator Company, Detroit. Other members are E. F. Hess, Ohio Injector Company, Wadsworth, Ohio, and Delos H. Wray, Henry Wray & Son, Inc., Rochester, N. Y.

For this meeting it is planned to discuss problems in orderly sequence, so that the foundryman who attends can take home a systematic arrangement of methods applicable to his own plant in locating and correcting difficulties without a laboratory or laboratory skill. However, the informality that has characterized these conferences in past years will again prevail.

For another nonferrous session, papers are tentatively scheduled on centrifugal castings, bearing metals, and effects of small additions of silicon, aluminum and phosphorus to leaded bronzes.

General Feature Sessions

Feature sessions of general interest to all foundrymen attending the 1933 Convention include the important conference on foundry housekeeping, and a unique dramatization of a foundry's experiences in setting up an efficient cost system. The good housekeeping conference is under joint auspices of the A. F. A., National Safety Council and National Founders' Association. Nationally recognized leaders will discuss plant conditions and equipment as affecting dust elimination, general safety and health provisions, and the data presented will enable many foundries to set their own plants in order to avoid existing hazards.

Dramatizing Foundry Costs

One original convention feature will be a four-act play on foundry costs. This play will dramatize a foundry's experiences and adventures in determining on and setting up a workable, efficient cost system. The event will be staged the afternoon of June 20 and is being prepared under direction of the A. F. A. Cost Committee with the cooperation of A. E. Grover, cost consultant of the Gray Iron Institute, Cleveland. Foundry managers and executives are urged to attend.

Trends in Materials Handling

A meeting of general interest is a joint session on materials handling, sponsored by the new joint committee of A. F. A. and the Materials Handling Division of American Society of Mechanical Engineers. Special consideration will be given materials handling problems of the small foundry under present operating conditions.

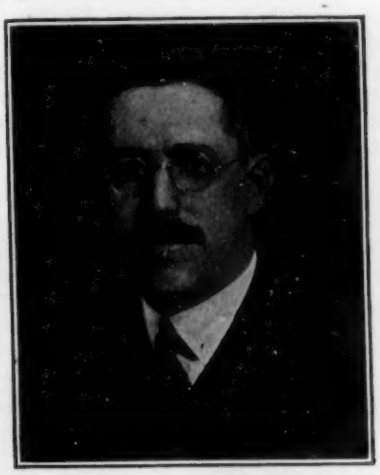
Exhibits Open Tuesday to Friday, Inclusive

Throughout the four days of the Convention, the Foundry and Industrial Exposition will be open from 8:30 A. M. to 5:00 P. M. in the Exhibition Hall of the Stevens Hotel. This Exhibit, the first to be staged by the Association since 1931, like the technical program, will be outstanding as to quality and interest. New equipment and improvements in standard equipment and products will feature this event. The exhibits thus will round out the week's activities by a display of modern methods essential to further progress of the industry.

Some of the Men Who Will Take an Active Part in the Convention

H. J. ROAST
Who Will Read a Paper on Additions to Leaded Bronze

H. M. ST. JOHN
Chairman of the Round Table Discussion



N. K. B. PATCH
Director, American Foundrymen's Association

Tentative Schedule of Sessions Related to Non-Ferrous Metals

Monday, June 19

Committee Meetings

Tuesday, June 20

Registration

Exhibits open at 9:00 A. M. (The exhibit will be open from 9:00 A. M. to 6:00 P. M. on each day of the convention.)

8:30 A. M. Shop Courses
(a) Sand—Application of Control Method to Continuous and Jobbing Foundries.

10:00 A. M. Formal Opening of Convention.
President's Address.

10:30 A. M. Foundry Sands
Application of Sand Testing by the Producer, by C. M. Hardy, Hougland & Hardy, Evansville, Ind.
Grain Structure Effect on Mold Permeability Control, by H. W. Dietert and F. Valtier, Detroit, Mich.

12:30 P. M. Joint A. F. A. and Foundry Equipment Manufacturers' Association Luncheon
Speaker—Fred Sargent, President, Chicago & Northwestern Railroad.

2:00 P. M. Foundry Costs
"Building for Profits," a dramatization of a foundry's experience with cost methods.

Wednesday, June 21

8:30 A. M. Shop Courses
(a) Sand—Classification.

10:00 A. M. Nonferrous Metals
Effects of Small Additions of Aluminum, Silicon and Phosphorus to a Leaded Bronze, by H. J. Roast, McGill University, Montreal, P. Q., Canada.
Bearing Metals, C. S. Cole, Copper and Brass Research Assn., New York City.
Beryllium-Copper Castings, E. F. Cone, New York City.

12:30 P. M. Round Table Luncheon Conferences
Nonferrous Founding—Chairman, H. M. St. John, Detroit Lubricator Company, Detroit.

Thursday, June 22

8:30 A. M. Shop Courses
(a) Sand—Control

10:00 A. M. Nonferrous Metals—Symposium on Deoxidation and Degasification of Bronze Foundry Alloys.
Alloy Group 1—Valve Bronzes (85-5-5-5 type)
Alloy Group 2—Leaded Bearing Bronzes (80-10-10 type)
Alloy Group 3—Tin Bronzes (88-11 type)

2:00 P. M. Business meeting

2:30 P. M. Foundry Housekeeping—Joint Meeting of A. F. A., National Safety Council and National Founders' Assn.

Friday, June 23

8:30 A. M. Shop Courses
(a) Sand Control

10:00 A. M. Materials Handling — Joint Meeting with Materials Handling Div. of American Society of Mechanical Engineers.
The Field of Materials Handling in Small Foundries, by Max Amos, Standard Automotive Parts Co., Muskegon, Mich.
The Field of Materials Handling in Semi-Production Foundries, by W. L. Seelbach, Forest City Foundries Co., Cleveland.

12:30 P. M. Conference on Apprentice Training

2:00 P. M. Conference on Foundry Education in Engineering Schools.

Metals at the Exposition

One of the most interesting exhibits at the Century of Progress International Exposition is shown by the Copper and Brass Research Association in the Mineral Industries Pavilion of the General Exhibits Group. It consists of new finishes designed to meet architectural requirements and also special alloys of copper to fill the demands of general manufacturing. Copper is shown with an artificial green patina reproducing the actual color acquired by exposure. Crystal-cote is a thin flexible coating of glass on copper which preserves the original lustre of the metal. Electrolytic copper sheet will be shown in such applications as room decorations, automobile tops, etc. New copper alloys include beryllium copper.

The copper industry is strikingly represented in the Central Station Industry Exhibit in the Electrical Group, by the Copper Highway, which consists of triple line of copper bus bars, extending a distance of 875 feet, on either side of which are shown the latest developments of the Electrical Age.

A wide variety of metals, metal products and metal finishes are shown by many of the large industrial companies—General Electric, Westinghouse, Union Carbide and others.

The Addition of Tellurium to Lead

The following conclusions were drawn by W. Singleton and Brinley Jones in a paper read before the meeting of the British Institute of Metals in London, March 8-9, 1933.

1. The addition of tellurium to lead raises the temperature of recrystallization. Tellurium-lead can therefore be permanently work-hardened for use at ordinary temperatures.

2. The effect of tellurium in preventing self-annealing after cold-working appears to be complete at about 0.05-0.06 per cent tellurium.

3. By adjustment of rolling conditions and heat-treatment, etc., tellurium-lead sheet containing not less than 99·9 per cent of lead can be produced having a range of strength of from 2,600 to 4,000 lb./in.^{2}.

4. By extrusion, tellurium-lead can be produced in a soft condition, having a very refined grain.

5. Extruded tellurium-lead, owing to the manner in which it responds to stress, will undergo an unusual degree of distortion before fracture. In water-pipes this is reflected in an enhanced resistance to bursting by frost.

6. The fatigue-limit of extruded tellurium-lead, on a basis of 10×10^6 reversals without fracture, is $\pm$ 0.50 tons/in.^{2}.

Melting Equipment in the Non-Ferrous Industry

By R. H. STONE

Chemical Engineer and Chairman, Technical Committee, Plumbago Crucible Association, in Collaboration With the Other Members of the Committee, K. E. Buck, H. P. Smith and H. E. White.

A Broad Consideration of All Types of Equipment for Various Needs. Factors Are Flexibility, Adaptability, Quality of Metal, Working Conditions and Costs—Part 2*

(5) Vertical Ring Induction Type

This furnace without the necessary transformers and accessories appears outwardly to consist of a vertical drum similar to the tilting type crucible furnace.

Similar to crucible furnaces, this furnace may be mounted on trunnions for ladle pouring or may be picked up bodily by a crane and the molds poured directly.

The interior of this furnace is, however, quite complicated as the charge is heated by acting as the secondary of an electrical transformer circuit. This circuit is in the lower portion of the furnace, the upper portion acting as a metal reservoir.

To produce circulation of the metal, this furnace utilizes a slight amount of thermal or gravity circulation, due to heating the metal from the bottom; some "pinch" force, due to the high current used; and a "motor" force due to the attraction or repulsion between two conductors respectively carrying current in the same or in opposite directions. The conductors being molten, the motor force causes a circulation of the molten material.

The circulation set up is very great, and this may be considered to a certain extent one of the defects of this type of furnace as the constant stirring and bringing fresh metal up to the surface tends to produce oxidation. Furthermore impurities will not separate out as well as they would in a more quiet bath.

In the lower portion of the furnace is a laminated iron transformer core about the central leg of which is wound a primary coil of flat copper insulated by asbestos tape. The primary is thus largely enclosed by the secondary loop. The core and primary are enclosed in a brass or other nonmagnetic casing. Air from a small motor-driven blower is led into this casing to cool the core and the primary.

The furnace does not require as thick a lining to attain a good thermal efficiency as many other types do, because at no time is any part of the hearth raised to a temperature above that at which the metal is poured. The heat is generated wholly in the metal itself. The problem of refractories is therefore not difficult as far as resistance to fusion at working temperatures is concerned, although other factors, as will be shown later, make this less simple than it appears from the point of view of temperature alone.

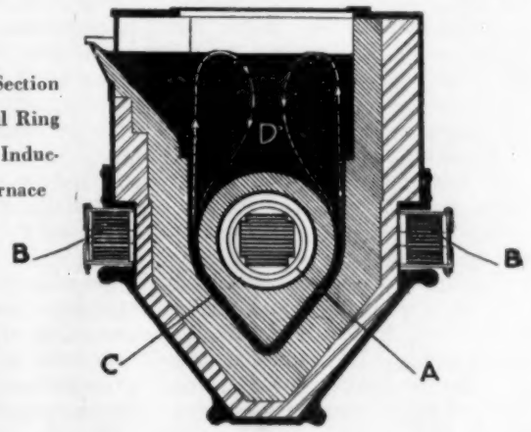


Fig. 5. Section of Vertical Ring Electric Induction Furnace

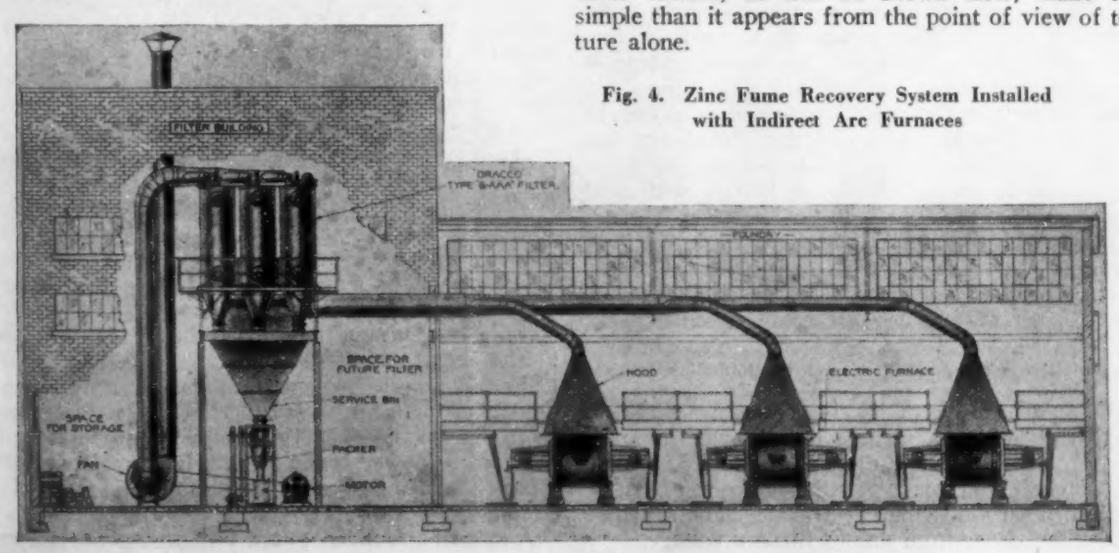


Fig. 4. Zinc Fume Recovery System Installed with Indirect Arc Furnaces

* Part 1 was published in our May issue.

There is no atmosphere of carbon monoxide in the furnace such as is found in the tightly closed types of electric brass furnaces using carbon or graphite electrodes. The furnace atmosphere is normally oxidizing, and it is necessary to maintain a good cover of charcoal over the metal to counteract this. On account of the oxidizing atmosphere there is a tendency for a crust of zinc oxide to form on the inside of the hearth at the top. In order to prevent this from reducing the hearth capacity, it is necessary to chip it out every two or three days.

Inasmuch as the power required by the furnace depends on the resistance of the molten metal in the resistor loop, and as the resistance of a 60-40 brass and of pure copper, for example, are widely different, it is obvious that if the furnace is to be used for such different alloys, an autotransformer must be provided for varying the furnace voltage. Alloys above 90 per cent in copper have, however, so low a resistance that a resistor of smaller cross section than that supplied for use on alloys high in zinc is required. It is more difficult to get a good power factor on the high copper alloys, and the furnace is in general not so well fitted for such use.

An even more important limitation lies in the fact that any short-circuiting of the resistor loop is fatal, and any break-out which allows molten metal to run down onto the primary coils or core puts the furnace out of commission and might damage parts of the furnace beyond repair. It is thus essential that the refractory forming the resistor loop be free from any tendency to crack which would allow fins of metal to penetrate it.

To meet these conditions, the resistor loop is made by ramming up a high temperature cement about a smooth triangular brass form the size and shape of the resistor loop to be made.

The furnace is dried out slowly in the air, then in an oven for several days, and finally heated gradually up to about 2000° F. to drive out all moisture and to set the cement firmly. The ramming and drying must be so well done that no cracks develop, and the operation requires skill and experience. Unless the work is properly done the life of the lining will be short.

To start the furnace, molten metal is poured into the secondary loop so as to complete the electrical circuit. Another method of starting is to thread the secondary loop with a metallic strip, but this operation is more difficult and not nearly as satisfactory as the use of the molten metal.

When the metal in the resistor tube reaches the boiling point, and bubbles of zinc vapor begin to be released, the resistance rises and the ammeter needle starts to vibrate or "kick". This means either that the whole charge is hot enough to pour, being analogous to the "jump" of an iron bar thrust into the crucible to serve as a "works pyrometer" on yellow brass, or else that the charge has bridged over in the hearth and needs poking down.

The materials at present used for linings withstand yellow brass successfully. They do not, however, so successfully withstand the action of alloys high in lead, which vigorously attacks most types of refractory linings. The makers do not advocate the furnace for alloys containing over 3 per cent to 3½ per cent of lead.

Advantages and Disadvantages of Vertical Ring Induction Furnace

From the point of view of its electrical characteristics, the vertical ring induction furnace is eminently satisfactory. For any one given alloy there is practically no fluctuation whatever in the load, and this absence of surge renders the ordinary distributing transformers satisfactory for stepping down from line to furnace voltage.

It is a compact furnace, requiring relatively little floor space. It has low metal loss on metals high in zinc. It mixes the metal thoroughly. It uses no electrodes or resistor carbon and requires only air cooling.

The disadvantages are that it must be operated twenty-four hours a day or else kept hot overnight by using enough power to keep the metal retained in the resistor-loop fluid. A freeze-up inevitably ruins the resistor tube and makes relining necessary. If it is to be shut down, all the metal must be drained out, and in starting up it must be thoroughly preheated, as by an oil or gas flame, and it must then be started by pouring in a charge that has been melted in another furnace. The retention from one heat to another of enough charge to fill the resistor and to make a connection in the hearth between both legs of the tube makes it difficult to change from one alloy to another, unless the charge is such that the retained metal can be worked into the composition of the next charge.

The furnace will not efficiently handle alloys very high in copper, nor can alloys of high lead content be handled with the present linings. Even 5 per cent lead will probably reduce the life of the lining considerably.

The furnace is obviously fitted then for use in a brass rolling mill, in which yellow brass is melted, and in which twenty-four hour, or at least sixteen hour operation may be counted on. There are rolling mills in which conditions are such that furnaces of larger capacity than the present commercial sizes are desirable. In general, however, the furnace is worthy of careful consideration by any rolling mill, and so far it holds first place in actual achievement in that class of work.

It is obviously not nearly so well fitted for use in foundries that do not melt large tonnages of yellow brass, or that must often change the composition of the charges in any one furnace. It is not fitted for use on high lead mixtures or on alloys 90 per cent or over in copper. It begins to operate at a decided handicap when it cannot be used at least 16 hours a day. For these reasons it cannot be considered at all by the average jobbing foundry, or in fact many production shops.

(6) Coreless Induction Type

The furnace itself as applied to brass or silver melting consists of a container which may be either (1) a loose crucible that can be lifted out, or (2) a crucible permanently fixed in a tilting type furnace. The container is commonly made of a graphite composition. This container is surrounded by a heat-insulating refractory which in small furnaces is made very thin in order to secure "close coupling" of the inductor or primary coil with the conducting crucible and the charge of brass itself, the latter two constituting the secondary. Large furnaces may be able to use a thicker refractory, since the radius of the crucible to be heated should theoretically be three-fourths the radius of the inductor coil.

Wrapped closely about the outside of the refractory is the "inductor", or primary, a spiral conductor that can be made of a nickel-chromium alloy air cooled, or may be of copper tubing water cooled. To this inductor spiral are connected the leads from the source of current.

The most successful types of coreless induction furnaces use a high frequency current generated by a Tesla oscillatory circuit in the small sizes and a rotary converter in the larger sizes. It is essential for operating with a satisfactory power factor to introduce condensers of large capacity sometimes called "capacitors" in parallel in the circuit.

A special grounded guard is placed about the primary

inductor to prevent shock, and a "focal inductor" may be used, placed inside the primary inductor and consisting of two parts joined together, one part made of copper near the primary, and the other of Nichrome or Monel near the crucible and in contact with it. The focal inductor may be grounded so that the high tension primary is within two grounded guards. The focal inductor also tends to increase the "close coupling" of the primary and secondary circuits, though it has the disadvantage of introducing something beside the material to be melted and the crucible containing it in the hot zone, which is against reliability, and limits the temperatures obtainable to the safe operating temperature of the material used for the inner portion of the focal inductor.

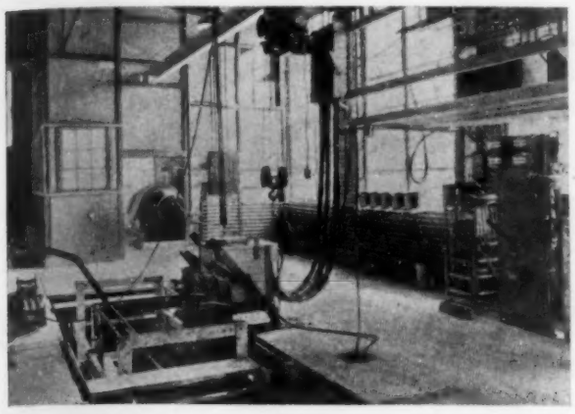


Fig. 6. Ajax-Northrup Coreless Electric Induction Furnace

Advantages and Disadvantages of the Coreless Induction Furnace

As high-frequency current is not at present generated or transmitted by central stations, a foundry wishing to utilize the coreless induction furnace must either be content with a comparatively small unit and with the use of a condenser set or else install its own high-frequency alternator with capacitors. The high voltage used at usual low frequencies would be dangerous to life, and care must be taken to ground the furnace to avoid shock. It is evident, however, that at the high frequency employed these high voltages are not dangerous as, in a test made by the Ajax Electro-thermic Corporation, a rabbit withstood the full voltage without injury.

The coreless induction furnace, however, is almost the acme in melting. It permits of melting the metal in a crucible without possibility of contamination either from fuel, furnace atmosphere or linings. Unfortunately the investment cost is high and electrical characteristics preclude the melting of high aluminum and zinc alloys of some types.

(7) Cupola Type

This is a recent adaptation of a small size iron cupola: it is identical with the iron cupola with the exception that the melting zone is much smaller and the blast pressure kept low, around 4 oz.

To prevent adherence of slag the melting zone must be lined with silicon carbide brick. The fuel bed is prepared in a manner similar to that in an iron cupola and the charge made up similarly. No flux is used with the exception that sometimes a small amount of soda ash is added to clean up any dirty scrap. This type of melting equipment was designed to be used with high carbon fuel such as pitch or petroleum coke; however, this is not essential. With high zinc brasses there is considerable volatilization of the zinc. The same is true of lead and tin to a slightly less degree. There is naturally a pick-up of any impurities entering into the charge. This unit is designed primarily for large operations where cost must be considered before quality.

One non-ferrous foundry using the cupola uses it to melt copper, which is then poured into crucibles and the other alloying metals added. Thus they speed up the melting process.

This article will be continued in an early issue—Ed.

Losses in Platinum Working

Q.—CAN you get for us some information on what the working loss on platinum is from the time it enters the factory until the article is produced . . in the making of hand made articles, machine made articles, wedding rings, etc.?

A.—There are so many factors involved in this question that it is impossible to give exact figures. Everyone agrees that slight losses are inevitable, but no two agree as to the proper percentages. However, a close consideration of the following factors will help in figuring and cutting down losses.

Losses are greater in summer than in winter. That is because windows are open and fans are blowing in summer; also the men's hands are damp and the fine filings cling and are carried away. A drafty shop loses more than one whose ventilation is controlled.

Some workmen lose less than others equally honest; they are more careful in sweeping up, etc.

Losses are greater with intricate designs than with simple ones. They are greater with hand work than machine work.

The following precautions will tend to reduce losses. Platinum filings and clippings should be carefully cleaned before melting. Do not attempt to burn out this dirt. You may succeed, but in the process you will lose platinum, too. Clean platinum melts much more quickly, and it pays in every way to insure its cleanliness. Hard-surfaced floors, free from cracks, tend to reduce losses. It has been said that the wash-barrels are a big source of loss. Do not feel that more settling is enough. Some sort of filtering of the waste water is advisable, if only through one layer of cloth. A single barrel, properly filtered, is better than a whole series of so-called settling barrels through which metal can float to the sewer.

Nothing has been said so far regarding the obvious factor of employee honesty. But in this connection an odd psychological fact might be mentioned. A large precious metal plant observed that on days when visitors were admitted, the general losses were slightly larger than on other days. It was not suggested that the guests had pilfered bits of metal; instead it seemed that the workers, diverted by visitors, and perhaps feeling subconsciously that their own responsibility was somehow divided, were less scrupulous in making their returns. This was so noticeable that the firm finally refused to admit any visitors whatsoever. J. M.

Non-Ferrous Foundry Ingot Shapes

By PIERCE BARKER
Metallurgical Engineer, Detroit, Mich.

A Complete Description of the Characteristics Demanded of Ingots for Foundry Use. Practical Reasons for the Various Shapes Used. Visual Inspection Important—Part 2*

Uniformity of Shape, Size, Weight, Quality and Composition

Uniformity is essential for foundries which pour a definite weight of metal and desire to replace a similar amount in a melting pot to maintain a definite pouring temperature, particularly in casting aluminum. Sometimes the melting furnace will be provided with a charging orifice which will permit just the size of ingot used, to pass through. Again, the melter soon learns the weight of the ingot, and although the total charge is weighed, he will wish to know just how much metal to charge at one time by counting the number of ingots; hence uniformity is essential.

This feature of ingot shapes is closely related to ease of casting, since economically to create a number of uniform ingots, the casting must be done rapidly and readily without fins or holes. Ingot casting conditions should be such that the man pouring may readily pour them to the same size or thickness without having many discards. Uniformity of shape comes from using the same type of molds. Uniformity of size is essential for stacking and piling, or for packing for shipment.

The metal must also be uniform in quality and composition. These requirements are frequently detailed in the purchase specifications. They state that suitable metal for the finished castings must be easily cast, machine well, and be close grained, where pressure is involved. It must be uniform in quality and composition, solid throughout, and be free and clean from detrimental oxides as well as other foreign substances or other metals that might be injurious to the proper working qualities of the alloy. Any deviation from these requirements is considered sufficient cause for rejecting either the whole or a part of the shipment.

Condition of Face or Top

The condition or appearance of the top or face of an ingot or bar, is an important factor in the sales appeal of the metal. The nature of the alloy and the kind of metal determine the condition of the top. Contained impurities affect it as do the casting and mold temperatures. In the case of copper, the pitch, purity and the casting temperatures affect the face. In high grade copper, the wrinkles or ridges on the face are fairly wide and at right angles to the longitudinal axis of the ingot, and the face is level for tough pitch.

In brasses, aluminum deoxidizes the metal causing a smooth face on the ingot which would otherwise be rough. Hence, aluminum bronzes, manganese bronze, nickel silver, etc., all have smooth tops or faces. The smooth top may be created in red brasses, bronzes or bearing metals, by deoxidizing the face with fine charcoal during the pouring operation. Attempts have been made to create similar smooth-top ingots in yellow brasses free from aluminum, but without success. In smooth-top ingots the face should be smooth and free from gas craters, porosity, discolorations and dross.

The face of aluminum ingots is smooth if the metal is fairly pure and freeflowing, and if the oxides are removed. Pure aluminum shows a deep shrink crack on the face, but alloys containing silicon will show no shrink. In brasses and bronzes, the top shrinks frequently indicate pure metal free from oxides and gases. The deeper the ingot, the greater will be the shrink crack. Therefore it is well not to have the depth of the ingots too great compared to the other dimensions, particularly in aluminum, but in brasses as well. In very large aluminum ingots with great depth, there will be such a deep shrink crack that the metal will lose its eye appeal, especially in 99 plus aluminum, where the shrink crack is an indication of the purity.

Size and Weight Suitable for Melting Requirements in the Foundry

Bars or ingots or sections of either, frequently must have a definite weight, and the size must be such that it can be readily handled either by hand or automatic means. The size and weight must also be suitable for feeding into furnaces and metal baths without difficulty or without undue chilling of the bath. Also the size must be such that it may be readily heated through and brought to melting temperature for rapid smelting.

Ease of Pouring

This characteristic depends upon a combination of the metal and the mold. Some alloys are more easily poured to obtain a good looking ingot than others. Again, some molds permit easier pouring than others. Very small bars with many notches are more difficult to pour, particularly if pouring in multiple, than are large ones with few bridges. Also, with no bridge, rapid pouring in multiple is possible. A medium shallow mold with few or no bridges, makes the best pouring bar, with the width of face equal to the height. The base of the mold must be wide enough to permit speed pouring without a fountain effect.

Ease of pouring depends upon a multiple arrangement of the molds and size and shape of same; also whether they are slabs or ingots. Slabs are readily poured and are used for zinc, antimony and hardeners, where rapid solidification is desired to prevent volatilization or segregation. Thus losses with zinc and antimony are reduced by pouring into slabs; and in the case of hardeners, segregation is

*Part 1 was published in our May issue.

reduced to a minimum by the rapid chilling the slab affords.

For hand operation, single pouring is easiest, but double, triple or even quadruple pouring either by hand or machine, saves time and is more economical. Metal of the nature of copper, is frequently poured five ingots at once, when casting by machine.

Bridges always increase the pouring time as they cause eddy currents which result in spattering when rapid pouring is attempted. Rapid pouring does not mean dumping the metal into the mold. This never gives a good looking ingot. Shallow ingots, of course, are not so rapidly poured per unit of volume as deep ones.

Ease of Removal from the Molds

This is an important characteristic from the ingot manufacturer's stand-point, as it contributes materially to economical production. When it is difficult to remove ingots from molds, speed of pouring is reduced, molds are tied up, extra labor is required for removal, and many broken or inferior ingots or molds result. Besides, unsatisfactory ingots must be remelted, with an extra melting cost and loss, and delay in production quotas.

Ease of removal requires proper pouring temperatures first. The mold must be at the correct temperatures. Then if the shape is designed correctly, the natural shrinkage of the metal will separate it from the mold, and permit easy dumping. In a properly designed mold, its surfaces must be smooth and free from pits, cracks or fins. No sharp corners are permitted as the metal locks in them, preventing the release of the ingot. Corners and edges must be bevelled and wherever possible, the design should be rounded and convexed. The metal composing the mold is important, and it has been claimed that this has a decided bearing upon the production of sound ingots.

On all ingots, the edges are bevelled to facilitate removal from the mold. The molds must be true to size and the walls solid and thick enough to withstand the sudden changes of temperature incident to quenching, and also the pounding sometimes found necessary to release an ingot. Notwithstanding the mold design, certain mixtures high in zinc, like yellow brass, are bound to stick, due to the zinc attack on the iron mold wall, causing pitting in varying degree. The same is true of high phosphorus red brasses which rapidly attack the mold walls.

The mold walls should be rather thick if long life is expected. This increases the first cost, but it is the most economical in the end, as the life is greatly prolonged in proportion. Some ingot manufacturers use molds having walls one inch thick; some, one and one quarter inches thick and some use molds with walls up to one and one-half inches thick. The life of the mold is greatly increased by the thicker wall.

The draft should be ample but not excessive. By having ample draft, the ingot is readily released from the wall upon setting, and hence it is readily removed. By not having it excessive, the stability of the ingot or pig is maintained. An ample draft allows the metal to draw away from the mold walls and any bridges for notches, allowing the shape to shrink just far enough not to stick. This will compensate for the added mold contact the bridges afford. When there are no bridges, the ingot sinks only as far as the shrink permits.

In general, molds without bridges furnish a style which permits more ready removal of the ingots than those with them. This is seen especially where the mold walls are attacked by the alloy, such as phosphor bronzes, zinc and zinc alloys, and other corrosive agents. The absence of bridges permits pouring a better ingot, as the bridge forms a pocket which creates eddy currents in pouring, and entrains air, thus frequently producing porosity in brass ingots. This does not hold true for aluminum, because it has one of the highest values for the latent heat of fusion, and the gas and air have opportunity to escape.

A shallow, round end mold makes a better ingot than a deep rectangular one. The shallow ingot permits more dross and gas to escape because they do not have to rise through a deep mass of metal which is rapidly cooling, and the rounded ends furnish less opportunity for pocketing dross. Also they facilitate the removal of the shape. These statements refer particularly to brasses, but are applicable to all metals cast into shapes.

Compactness

The mold design should conform to the idea of compactness. The notches should not be so large that gaps result in piling, as this wastes space. The notches are for the purpose of assisting the breaking in making weights, to facilitate rapid remelting and chillings, and to assist removal from the molds, and they should not be so large that weight and space are sacrificed in packing and piling. Sometimes notches are placed in the ingot for the purpose of giving it a distinctive shape, or the shape of the notch itself may be novel. And again, the custom of the trade demands a more or less characteristic shape, as in the case of copper.

Rapid and Economical Handling

Bars, ingots and pigs must be of such a shape that they may be rapidly and economically handled. In the case of metals of low specific gravity like aluminum, the ingot size is less important than for lead, which has about the highest specific gravity of the common non-ferrous metals. These shapes, in the case of lead, must be of such weight that men can handle them with fair rapidity. In addition they must be of convenient weight for metal additions to heats. Transportation, stacking and charging machines are in use, but men must still handle the pigs in many smelters and foundries. The maximum convenient weight is 100 pounds for pigs, as in the case of lead, down to a minimum weight in ounces for both lead and aluminum bars. Lead and tin pigs are readily sheared, or cut with hot iron bars, so they come in pigs of 100 pounds or less. Zinc and antimony are cast into slabs of about 50 pounds each, for rapid cooling, because of their volatility. Copper comes in ingots of 22 to 25 pounds, and brasses and bronzes in 25 to 35 pound ingots, depending upon analysis. Many smelters cast a particular brass or bronze in a distinctive shape so that the foundry may readily know just what the alloy is from the ingot shape.

This article will be continued in an early issue—Ed.

Whitening Steel Pins

Q.—Are you in a position by any chance to advise us of the present-day methods employed by pin manufacturers in whitening their ordinary steel toilet pins?

A.—The pins are cleaned and then either brass or copper plated in a solution from which a bright deposit can be had. To obtain a higher lustre they are rolled in sawdust. The tinning is done in a cream of tartar tin solution such as used for brass pins.

The cylinder for the plating has special panels with perforations that will permit circulation of solution and yet hold sharp pointed pins. Special equipment is required. E. E.

Electrochemical Society Meeting

Abstracts of Papers on Electrodeposits Read at the Sixty-third Meeting in Montreal, Canada, May 11-13, 1933

AT the recent meeting of the Electrochemical Society held at Montreal the following new officers were elected:

President: Dr. John Johnson, Director of Research, U. S. Steel Corp.

Vice Presidents: Prof. Hiram S. Lukens, University of Pennsylvania; E. F. Cone, of Iron Age, New York; S. G. Blaylock, Manager, Consolidated Mining & Smelting Co., Trail, B. C.

Managers: S. D. Kirkpatrick, Editor, Chemical & Metallurgical Engineering, N. Y. City; O. W. Storey, Burgess Research Laboratories, Madison, Wis.; T. F. Baily, Electric Furnace Engineer, Alliance, Ohio.

Treasurer: Dr. Robert M. Burns, Bell Labs., New York City.

Secretary: Dr. Colin G. Fink, Columbia University, N. Y. City.

At this Montreal meeting, also, three awards were made: **Edward Goodrich Acheson Medal** to **Dr. Colin G. Fink**: **Edward Weston Fellowship 1933-34** to **R. D. Blue** of Indiana University. **Society's Annual Prize to Young Authors** to **Frank W. Godsey, Jr.**, of New Haven, Conn., for his paper on The Electrolytic Condenser.

DR. C. G. FINK
Who Was Awarded the Edward Goodrich Acheson Medal

CHROMIUM PLATING ON ZINC

By M. DEKAY THOMPSON and F. C. JELEN

Samples of sheet zinc 98.5 per cent pure and of the dimensions 0.046 by 17.8 by 2.5 cm. (0.018 by 7 by 1 in.) were plated with different thicknesses of nickel, then with different thicknesses of chromium and were tested by immersion in 20 per cent sodium chloride and in 5 per cent sodium sulphate solutions. The time required for the sample to lose its pleasing appearance was considered its life. It was found that the life of a sample prepared in this way is proportional to the thickness of the underlying nickel and independent of the thickness of the chromium up to a thickness corresponding to a 15 minute plate, which is 0.00034 cm. (0.00014 in.). The protection afforded by the underlying nickel depends on the solution from which it is plated. Chromium plated on copper separated from zinc by a thin layer of nickel (to prevent its diffusion into the zinc) does not last as long as when the chromium is plated on nickel of the same thickness as copper. With copper as an underlying metal the life does depend on the thickness of the chromium deposit because of the difference in color between chromium and copper. As a preparation of zinc for chromium plating, a composite deposit of nickel and copper is two to three times as efficient as nickel alone with the same thickness as that of the composite deposit. Intermediate layers of tin and of cadmium followed by chromium did not give good protection, and chromium deposited directly on zinc gave relatively poor protection. Difficulty was found in chromium plating deposits of nickel on zinc unless the nickel plate were heated in boiling water for thirty minutes. This trouble did not occur with die castings.

THE ELECTRODEPOSITION OF TERNARY ALLOYS OF CADMIUM, ZINC AND ANTIMONY

By LAWRENCE E. STOUT and LEONARD GOLDSTEIN

A theoretical discussion and data on the deposition of ternary alloys of cadmium, zinc and antimony from solutions of the complex cyanides of cadmium, zinc, potassium antimonyl tartrate, sodium cyanide and sodium hydroxide. It is demonstrated that the composition of the deposit is determined by the composition of the bath, current density and temperature. It is also demonstrated that the resistance of the deposit to corrosion is largely a function of the cadmium content of the plate, and is reduced slightly by the antimony content.

SOME NEW ORGANIC ADDITION AGENTS FOR CADMIUM ELECTROPLATING

By R. A. CLAUSSEN and H. L. OLIN

Cadmium plating has been rapidly finding world-wide recognition. There is doubtless an important niche in the electroplating industry for cadmium. With the proper addition agent, higher current densities may be employed and at the same time the throwing power is improved. Casein, bindex and gulac were used as standards of comparison. Among the new addition agents investigated were Steffen's waste (by-product of the sugar industry) and the concentrated steep water produced in the initial soaking of corn in starch manufacture. Steffen's waste compares favorably with gulac and gives a higher throwing power than the latter. Current densities must be 3.5 to 5.0 amp./dm. for best results. Steep water also gave a better throwing power than gulac. Casein and bindex have a narrower current density range than either gulac, Steffen's waste or steep water.

THEORIES OF ADDITION AGENT ACTION

By Robert Taft

There are at least two types of addition agent action. In one type the addition agent is actually included within the deposit. Adsorption of addition agent by metal appears to be the best explanation of this type. In the second type of addition agent action the "addition agent" is reduced simultaneously with the metal ion. In such cases as have been studied of this type the addition agent is not included within the deposit. An explanation of the reduction in cathode polarization which accompanies the use of certain addition agents is advanced.

NICKEL PLATING OF FABRICATED ZINC IN A BARREL

By Albert Hirsch

Copper plating upon a ball-burnished surface of zinc results in blistering of the copper deposits due, possibly, to a highly mechanically strained film of metal produced by the burnisher.

Nickel plating directly on a roughened zinc surface does not yield that bright metallic luster after ball burnishing which is obtainable by nickel plating a ball-burnished copper deposit. However, roughening the surface of the zinc, copper plating and ball burnishing the copper, and ball burnishing the final nickel deposit, give a reproducible finish.

A STUDY OF CYANIDE ZINC PLATING BATHS USING THE ALUMINUM MERCURY ZINC ANODE

By A. Kenneth Graham

The performance of the aluminum mercury zinc anode was studied in 1 *N* Zn $(CN)_2$ baths at 20 amp./sq. ft. (2.2 amp./dm.) and 120° F. (49° C.). The sodium cyanide was varied from 0.5 to 1.5 *N* and the sodium hydroxide from 0 to 1.9 *N*. The current efficiencies, anode polarization, bath voltage, solution maintenance and sludge formation were observed. The effect of sodium carbonate additions, of reducing the $Zn(CN)_2$ concentration to 0.75 *N* and of substituting a pure zinc anode were also studied. Superior operating characteristics of baths are found within certain recommended optimum concentration limits for both NaCN and NaOH.

ELECTRODEPOSITION OF METALS AND ALLOYS FROM FORMAMIDE SOLUTIONS

By R. D. Blue and F. C. Mathers

While pure aluminum could not be deposited from a solution of aluminum chloride in formamide, alloys of aluminum with iron, and with zinc could be deposited. The quantity of aluminum reached 17.65 per cent in the alloy with iron. The addition of dry hydrochloric acid gas to the baths improved the deposits from solutions in formamide of the chlorides of most of the common metals, but interfered with the decomposition of aluminum alloys.

ELECTROLYTIC ZINC: THE DETERMINATION OF SMALL AMOUNTS OF GERMANIUM

By Harald Lundin

As previously reported, mere traces of germanium seriously interfere with the electrodeposition of zinc. A new analytical method for the detection and determination of these traces has been developed which is particularly applicable to materials containing silica. Detailed procedure is given: it involves the volatilization of silicon as fluoride; next, distilling out the germanium as chloride; precipitating a solution of this with H_2S; igniting the precipitate to GeO_2; and from the weight of this, calculating the percentage germanium present.

A CYANIDE-FREE BATH FOR THE DEPOSITION OF COPPER ON STEEL

By Colin G. Fink and Chaak Y. Wong

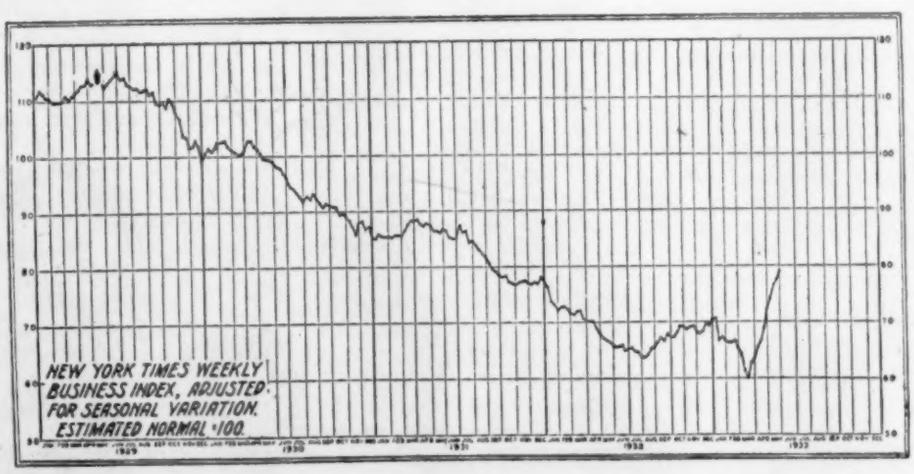
The development of large automatic plating installations for strip steel, standard steel parts, etc., has emphasized the inadequacy of the copper cyanide bath. Besides being decidedly poisonous, it is very unstable, rapidly carbonating during use. To meet the demand for a copper strike bath, which is relatively stable and which may be followed by an acid bath with perfect safety, the authors have developed a sulfate-oxalate bath which produces a satisfactory copper deposit in 60 seconds at a current density of 10 amp./sq. ft. (1.1 amp./dm.).

An additional abstract appears on page 209.

Business Index Shows Steady Rise Over Ten Weeks

THE accompanying chart shows the trend of business as calculated by The New York Times on the basis of the major indices of business,—freight car loadings, steel mill activity, electric power production, automobile production, and other items.

The chart shown here is complete to May 31, and shows a steady uptrend for ten weeks, as against the downtrend and lower index number a year ago. The "normal" basis of 100 was touched in 1930.



Rhodium Plating

By Dr. COLIN G. FINK and GEORGE C. LAMBROS

Head, Division of Electrochemistry, Columbia University, and Student, Electrochemical Laboratories, Columbia University, respectively.

The Authors Prepared the Salts for Their Plating Baths by Alloying Rhodium with Lead and Bismuth and Then Treating the Regulus with Acids and Alkali, Resulting in $Rh(OH)_3.H_2O$. This Salt Was Converted, in Turn, Into the Sulfate, Phosphate, Chloride and Other Compounds and Plating Baths Prepared. The Ammonium Sulfate Bath Gave Most Satisfactory Results

A PAPER PRESENTED AT THE SIXTY-THIRD GENERAL MEETING OF THE ELECTRO-CHEMICAL SOCIETY, HELD AT MONTREAL, CANADA, MAY 11, 12 AND 13, 1933.

RHODIUM-PLATING has recently come into use in the jewelry and reflector industries. Rh is a precious metal of a pleasing pinkish-white lustre, costing about 2 to 2½ times as much as gold. It belongs to the platinum group of metals and occurs naturally associated or alloyed with Pt, the Rh-rich grains containing from 2 to 4.5 per cent Rh.

Rhodium has been used commercially in the past, but mostly as the 90:10 Pt alloy. This alloy forms the important electrode in the well known Le Chatelier pyrometer; the alloy is also used as catalytic contact material in the oxidation of ammonia to nitric acid (Ostwald Process); also for laboratory dishes and as winding for high temperature laboratory furnaces.

At temperatures above 300°C. Rh tends to oxidize and is readily attacked by chlorine; when pure, it is almost insoluble in aqua regia. If Pt ores are treated with aqua regia, Os, Ir, and Ru remain behind, whereas Pt, Pd and most of the Rh go into solution. Like cobalt, Rh forms several series of compounds with ammonia. The melting point of Rh, 1.970°C., is above that of Pt.

The world's annual production of Rh metal is comparatively small. It is now approximately 4,000 troy ounces or 125 kg.

Table I.[1]—Properties of Rhodium.

PHYSICAL PROPERTIES		CHEMICAL PROPERTIES
Reflectivity (4,500 to 6,500 A. U.)		**Soluble in:**
Rh.....	45	Concentrated H_2SO_4
Ag.....	90	Fused $KHSO_4$
Thermal Conductivity		Fused $NaCl + Cl_2$
Rh.....	0.894 watts/(cm. °C.)	**Insoluble in:**
Ag.....	4.19	Concentrated HNO_3
Ni	0.586	Concentrated HCl
Thermal Expansion Coeff.		**Water Soluble Salts:**
Rh.....	8.9×10^{-6} (0°—300° C.)	$Rh_2(SO_4)_3 \cdot 12\ H_2O$
Ag.....	19.6 "	$K_2SO_4 . Rh_2(SO_4)_3 . 24\ H_2O$
Ni	14.5 "	$K_6Rh_2(SO_4)_6$
Cr	8.1 "	$RhPO_4 \cdot 3\ H_2O$
Glass (Pb)	8.2 "	$RhCl_3 . 4\ H_2O$
Specific Gravity		$RhBr_3 \cdot 2\ H_2O$
Rh.....	12.4	$Na_3RhCl_6 \cdot 12\ H_2O$
Ag.....	10.5	Besides salts of a number of organic acids.
Cr	6.5	
Brinell Hardness[2]		**Alloys with:**
Rh.....	101—152	Pt metals; Au; Ag; Zn: (acid insol.).
Ag.....	61—130	Cu; Pb; Bi; (acid soluble).
Ni	155—420	
Cr	500—900	**Oxides:**
		Rh_2O (blue); RhO; Rh_2O_3 (black); RhO_2.

In 1901 Piccini and Marino[3] electrodeposited Rh from a solution of Rh caesium alum ($Cs_2SO_4 . Rh_2(SO_4)_3 . 24\ H_2O$). Their process, however, was not commercialized and no details of a commercial Rh plating bath have since been described in the literature. United States patents[4] have been assigned to Baker & Company of Newark, N. J., covering the plating of Rh from tetrammino nitrite. A French patent[5], assigned to Precious Metals Development Corp., describes the electrodeposition of a Pd-Rh alloy from a solution of an alkali phosphate and salts of Pd and Rh. H_3BO_3 is preferably present.

Joseph Rossman of the U. S. Patent Department has published a short review of the American Rh plating patents[6]. L. Cinamon[7] comments briefly on the relative merits of the phosphate and sulfate baths. He favors the sulfate bath: it is easier to prepare and operates at lower voltages.

Experimental.

We used three methods to obtain Rh in solution: (a) Finely divided metallic Rh was alloyed with three parts of Pb plus three parts of Bi and the resulting alloy was dissolved in aqua regia. Sufficient sulfuric acid was added to precipitate the Pb and the excess acids evaporated. The resulting paste was diluted with enough water to precipitate all the Bi as BiOCl and the Pb as $PbSO_4$. To the filtrate KOH was added, to precipitate the Rh as $Rh(OH)_3 . H_2O$, which is very soluble in acids.

(b) Chlorine gas was passed over finely divided Rh metal intimately mixed with $BaCl_2$.

(c) Rh metal was converted into the sulfate by fusion with $KHSO_4$.

Starting out with samples of $Rh(OH)_3 . H_2O$, the following acids were used to dissolve it and the resulting solutions investigated for their plating possibilities: Sulfuric acid, phosphoric acid, hydrochloric acid, tartaric acid, citric acid and nitric acid.

(1) With **sulfuric acid** the resulting solution was found to plate out Rh, but the quality of the deposit is very sensitive to changes in current density and acidity, and therefore this bath did not appeal to us as being practical. However, when Na_2SO_4 was added to this bath, it became stable, and with an acid content of 0.2 mol/L. and 30 g./L. Na_2SO_4, and operating at a temperature of about 50°C., the deposits were very satisfactory. With

[1] Based on Int. Crit. Tables; Comey-Hahn; F. E. Carter; F. E. Matthews; W. H Swanger; J. N. Friend; and personal data.
[2] Bissell, Melliand Textile Monthly 3, No. 3 (1931). Swanger, Res. Pap. 127, U. S. Bur. Stand, Dec. 1929.
[3] Z. anorg. Chem., 27, 62 (1901).
[4] No. 1,779,436 and No. 1,779,457, October, 1930. Metal Ind. (N. Y.), 29, 245 (1931).
[5] No. 711,081, February, 1931.
[6] Metal Ind. (N. Y.), 29, 245 (1931).
[7] Brass World, 28, 97 (1932).

this buffered bath the acidity may be varied within comparatively wide limits, but for good, bright, whitish deposits, the amount of Na_2SO_4 must be varied in proportion to the acid. When the acidity of this bath is very low and some Na_2SO_4 is present, the bath becomes unstable and $Rh(OH)_3$ is precipitated at the cathode, due to local rise in pH.

(2) When **phosphoric acid** was used to dissolve the $Rh(OH)_3.H_2O$, the resulting phosphate solution gave about the same results as the sulfate bath; we added Na_2HPO_4 to the solution in place of the Na_2SO_4. The voltage required is a little higher for this bath than for the sulfate bath.

(3) When **hydrochloric acid** was used alone to dissolve the $Rh(OH)_3.H_2O$, no satisfactory bath was obtained. An HCl plus NaCl bath was not tried.

(4) We also prepared a **mixed sulfuric plus phosphoric acid** solution. To a phosphate solution containing about O.1 mol/L. of phosphoric acid (without any sodium salts), 0.5 mol/L. of sulfuric acid was added. The resulting bath gave very good deposits.

(5) Next, **tartaric acid together with sulfuric acid** was used to dissolve the $Rh(OH)_3.H_2O$, but no satisfactory deposits could be obtained.

(6) **Citric plus sulfuric acid** was tried and the resulting solution gave good, bright deposits at about 50°C. The free citric acid was 0.1 mol/L. and the H_2SO_4, 0.5 mol/L.

(7) Next, **nitric acid plus sulfuric** was used. This bath was made as follows: the $Rh(OH)_3.H_2O$ was dissolved in HNO_3 and the nitrate solution was made up to contain about 40 g./L. Rh and 3 mols/L. free nitric acid.

To make this bath, about 100 cc. of this concentrated solution is diluted to 1,000-2,000 cc. and about 20 cc. conc. H_2SO_4 added. The current density should be 0.5 amp./sq. in. (8 amp./dm^2.), and the temperature should be about 50°C. for general plating practice and best deposits. When the Rh content is depleted, more concentrated solution is added, the HNO_3 being used up continually.

(8) Referring to the three methods discussed above for obtaining Rh in solution, if NH_4OH is substituted for the KOH, the resulting precipitate dissolved in H_2SO_4, then diluting the solution to 4 g./L. Rh and adding 3 per cent $(NH_4)_2SO_4$ and enough conc. H_2SO_4 to make its total 80 g./L., the resulting bath gives excellent results. On brass the following deposits were obtained at 50°C. at a current density of 0.5 amp./sq. in. (8 amp./dm.^{2}).

Time of Plating Seconds	Rhodium Plated Grams	Rh: mg./cm.^{2}
5	0.020	0.05
10	0.050	0.13
15	0.070	0.18
25	0.110	0.28

The conductivity of this solution is very good and the voltage drop across the electrodes is about 2. The deposit is dense and brilliantly white, and no polishing is needed. The current density might be reduced to as low as 0.03 amp./sq. in. (0.47 amp./dm.^{2}), but to obtain a good coating, much longer time is then required,—for example, a brass strip of 6 sq. in. (39 cm.^{2}) was plated for 10 minutes at 0.03 amp./sq. in. (0.47 amp./dm.^{2}) and the weight of Rh deposited was 0.03 g., or 0.8 mg./cm.^{2}

Discussion of Experimental Results.

The factors to be considered in Rh electrodeposition are: acidity of solution, current density, amount of sodium (or other) salts present, amount of Rh salts present, temperature, resistance of solution, over-voltage, polarization, and nature of cathode.

In all of the Rh baths we investigated, one thing appears to be certain, namely, that, as the temperature is increased above 20°C., the deposits become better, brighter and whiter. At about 50°C., and even higher, the best-looking deposits are obtained.[8] Since gas polarization, concentration polarization and overvoltage decrease with increase in bath temperature, we are led to conclude that low polarization and low overvoltage are necessary for good Rh deposits. As regards the current density, this also must be kept within certain limits; it should not exceed 0.6 amp./sq. in. (9 amp./dm^2.).

Since there are a number of baths that may be used for Rh plating, the relative degree of brightness of the deposit becomes an important question. Undoubtedly size of crystal affects the brightness of deposit.

Comparing the properties of the various Rh baths described above as to whiteness and smoothness of Rh deposit, working range limits of bath and stability of the bath, we concluded on the basis of our experiments that the ammonium sulfate bath (No. 8 above) was the most acceptable commercially.

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[8] Compare Fink and Jones, Trans. Electrochem. Soc., 59, 471-2 (1931).

New Refractory for Electric Furnaces

By G. S. Diamond.*

An improved silicon carbide refractory brick for electric furnaces has been developed. The thermal expansion is exceptionally low, being only 1/9 that of silica brick. The electrical and thermal conductivities are much higher than those of silica refractories. The carbon bond gives rigidity up to the dissociation temperature of silicon carbide. Tercod is inert to acid or neutral slags, but is attacked by basic slags. The boro-silicate glazed brick is applicable to furnaces melting irons with 3 per cent C or above and melting non-ferrous metals. Experiments have been made with fused alumina glazes; bricks thus faced have been successfully used in melting low carbon steels and nickel.

* Vice President, Electro Refractories and Alloys Corporation, Buffalo, N. Y. Abstract of a paper read at the meeting of the Electrochemical Society in Montreal, Canada, May 11-13, 1933.

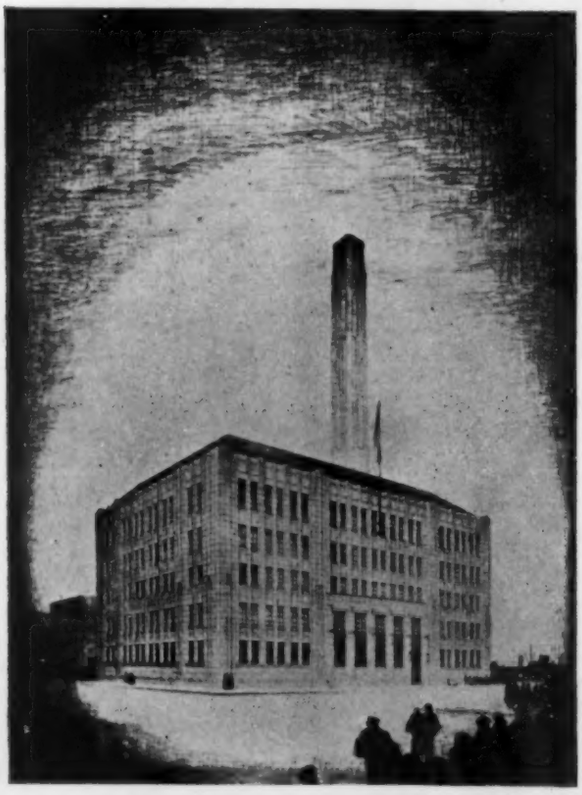
Uncle Sam's Gold Warehouse

An Abstract of a Description of the New Assay Office in New York, from a Recent Radio Broadcast

THREE quarters of a century ago, in 1854, the United States Assay Office opened its doors at 32 Wall Street, New York, and continued in business all these years on that historic site.

In 1822, Daniel Verplanck sold this parcel of land to the Bank of the United States for $40,000, a consideration which was deemed large at that time. Very recently, this same property was purchased from Uncle Sam by the Forty Wall Street Corporation for $6,500,000.

The Government then acquired the property facing the East River at Old Slip, which combined with the cost of constructing the new building amounted to about $4,000,000 leaving a balance earned on the transaction of



United States Assay Office Building, 32 Old Slip, New York City

$2,500,000. Hence at a profit of $2,500,000 the Treasury Department was able to provide the Assay Office with larger and more up-to-date quarters which were opened for business September, 1932.

Although the Assay Office had been historical on Wall Street, its removal had long been urged by many people in that section. This has been due to the fact that the Assay Office is, in truth, a kind of a factory where smelting and refining is carried on, resulting in disagreeable fumes in the neighborhood.

The new building, however, with its 160 foot stack and special apparatus to collect smoke and fumes, together with its location along the waterfront, will offer no trouble. It is built of steel and concrete, and faced with granite. In it is a four story vault extending two stories into the basement with a concrete and steel foundation on a rock bed below the water level, 31 by 70 feet in size.

One of the interesting features of the new Assay Office is the precipitator, the purpose of which is to recapture and reclaim fine particles of gold which would be otherwise carried out by the fumes during the process of smelting and refining. The apparatus and installation cost $80,000, but it is expected to reclaim and save more than $10,000 a year.

Along with this precipitator is an apparatus for the burning of all rubbish and waste that is accumulated in our work.

From deposits of a few thousand dollars in 1854, the importance of this Office has increased to such an extent that at present, the aggregate value of receipts amounts to hundreds of millions of dollars annually. We have actually received and melted in a single year, one thousand tons of the yellow metal having a value of well over a half billion dollars. In the last decade, this yellow stream of metal pouring in has amounted in value to approximately four billion dollars.

A shaft of gold four feet square towering to the height of the Woolworth Building would give a picture of just how much four billion dollars of gold represents.

The Assay Office purchases gold in any amounts from $100 in value and up, in any form suitable for Mint purposes and from any source. This gold comes in a variety of forms; bars, amalgam, nuggets and grains from the mines, old gold and silver, jewelry, scrap from manufacturing jewelers and dentists, gold coin from all the countries of the world, refined bars, mixed bullion, and light weight and mutilated United States coin.

A very interesting and unusual deposit was received a few years ago from a shipper in South America. He desired to send a considerable quantity of silver bullion to this country, but discovered that the cost of shipping the bullion in the vessel's strong box would make the transaction unprofitable. This versatile depositor took his bullion to a foundry and had it cast into machinery parts; wheels, gears, shafts, etc., and shipped it as ordinary freight. It reached the Assay Office intact and to the casual observer would never be considered as other than cast iron.

Immediately upon its receipt, the deposit is weighed. The weight is recorded together with a description of the deposit and a receipt is given. It is at once sent to the melting room where it is melted in a graphite crucible at a temperature of about 2000° F., thoroughly mixed and a sample taken for the assay determination. This sample is either taken from the molten metal or, in the case of small deposits, by a chip from the cast bar. The assay determines the proportion of gold and silver in the alloy or what is termed the "fineness" of the bullion. The melted deposit is again weighed and the value is computed on the basis of the assays made. Payment is made by check drawn by the Superintendent of the Office on the Treasurer of the United States or by cash when re-

quested by the depositor. The purchase is made on the actual gold value at the uniform fixed rate of $20.67 per fine ounce, a nominal charge being made for the melting and refining costs. Silver is paid for in refined silver bars which in turn are marketed by the depositor at the current price in the open market.

To render this bullion suitable for the government's uses, it must be refined and this refining is done by electrolysis, a child of electroplating which came first and formed the basis of the discoveries of electrolytic refining. Thin slabs about eighteen inches long, by three inches wide by ¼ inch thick, having a composition of about one-third gold and two-thirds silver are placed in muslin bags and suspended in an acid solution opposite a strip of pure silver. Under the action of the electric current, the silver in the slab is dissolved and deposited on the silver strip in silver-white crystals. These crystals are scraped off into large stoneware jars, washed free of acid and then find their way to the melting pot, and the silver cast into its final form of refined silver bars. The gold remaining in the muslin bag is washed, melted and cast into slabs. These slabs are suspended in a different acid solution opposite thinly rolled strips of pure gold. Under current action the gold in the slab is dissolved and deposited in a pure state on the strip. The deposit is not crystalline as was the case with the silver, but appears in a warty, coherent, dense form. This in turn is melted and cast into refined bars ready for the vaults or for trade purposes.

Refined bars for the trade run in varying sizes, from $100 in value up to $5,000. Each bar carries on its surface its complete life's history. It bears the official stamp of the Assay Office, the year it was melted, the serial number for that year, the weight, the assay fineness and value.

The standard size gold bar is about seven inches long, three and one-half inches wide, and one and three-quarters inches thick and has a value of about $8,000. These bars are used for shipments to the mints for coinage purposes or for exportations to foreign countries. Some are placed in storage against the outstanding gold certificates.

Platinum played an important part in the World War in the manufacture of munitions and it might be of interest to know that the thousands of ounces of that metal purchased by the government for the War Department were received, assayed and refined at this office. They were delivered to that department in a form suitable for their uses. During that period, the Assay Office also fabricated platinum ware and apparatus for the various departments of the government. These intensive platinum operations saved our government thousands of dollars.

The Director of the Mint from 1923 to this year was Robert J. Grant, who resigned to become advisor to the Chinese Government, in charge of the mint in Shanghai. The new Director is Mrs. Nellie Tayloe Ross, former Governor of Wyoming.

Refining Rolled and Filled Gold

By JEWELRY METALLURGIST

Q.—Please describe the method by which gold filled or rolled gold is refined. I have been told the process is not specially profitable. Why is that? What process does the Government use in handling such material?

A.—Rolled or filled gold consists of a large core of base metal such as brass, with a thin layer of gold alloy on one or both sides. The gold layer is commonly 10-k or 12-k, and it constitutes perhaps 1/10 to 1/40 of the weight of the article, more or less. Electroplated goods are almost wholly base metal, the film of gold being extremely thin.

It is plain that the actual amount of fine gold in this class of goods is small. For instance, consider the case of rolled gold which, when new, assayed 1/40 12-k gold. That makes it 1/80 fine gold, and 79/80 base metal. Old jewelry will run lower, because of the loss of parts of the gold layer from friction. Plated goods runs even lower.

The recovery of the gold is accomplished in several different ways, of which the following are common.

1. If the amount is small, the owner will probably begin by dissolving as much as possible of the base metal in nitric acid. This treatment will leave as a residue a few scales of the gold alloy that constituted the outer layer, which may be melted up and sold, or possibly refined further. In this process the operator consumes considerable acid. If the film of gold is very thin, the returns may not pay for the acid.

2. In most shops, scrap of this kind is worked in with other material. For example, a refiner has considerable clean rolled gold scrap; also some material (such as bench sweeps or filings) that contain emery or other dirt. He can melt up all this stuff together. In that way, the clean scrap helps to flux off the dirt, and the button of gold that is secured is comparatively easy to handle.

3. When extremely large quantities of rolled or plated scrap are available, they may be refined after the manner of crude copper. Crude copper is smelted and cast into huge anodes, which are refined electrolytically. In this process the anodes dissolve and pure copper is deposited on a cathode of previously prepared pure copper. The impurities (including gold and silver) go into solution or drop to the bottom of the tank as a sludge. Rolled gold scrap is often refined in this way. The process is carried on in enormous volume, at a very small cost per pound. The gold and silver are recovered as by-products. Undoubtedly this is the most economical method of handling this material.

4. Returning for a moment to methods suitable for small scale refining, the idea of stripping off the thin gold layer, in some manner that will leave untouched the base metal core, is very attractive. Unfortunately, solvents that will dissolve gold will, at the same time, dissolve the core. However, if the pieces are sizable enough to be wired together readily, they may be treated by the so-called "reverse current," in a cyanide solution. In principle this is the same as stripping fire-coat with the reverse current. Gold dissolves, and can be recovered later from the solution and the cathode. But even if watched, the process may dissolve considerable of the core before all the gold has been removed.

As to the method used by the U. S. Government, at present the Assay Offices are not buying shipments of rolled or plated goods. If scraps of this kind are included in shipments that are acceptable, they will be melted in with the higher grade goods, the bars finally being refined by electrolytic methods.

EDITORIALS

National Industrial Reorganization

WE are faced with the imminent passage of a bill in Washington which is so unusual as to be almost revolutionary. The National Industrial Recovery Bill, which has already passed the House and is now pending before the Senate is the fulfillment of the President's promise made before the Chamber of Commerce of the United States, on Thursday, May 4th, to attempt to restore mass purchasing power by spreading work. To accomplish this, it is declared that a national emergency exists and that it is to be the policy of Congress to promote the organization of industry for the purpose of cooperative action among trade groups, to induce and maintain united action of labor and management under adequate governmental sanctions and supervision to eliminate unfair competitive practice, to relieve unemployment, to maintain standards of labor and otherwise to rehabilitate industry and to conserve national resources. The normal procedure will be that a trade or industrial association will agree upon a code of fair competition that will be submitted to the Administration for approval. After this code is approved it becomes a standard of fair competition for the industry, binding not only upon those who belong to the trade organization, but upon others engaged in that trade. Any violation will be considered an unfair method of competition, subject to the jurisdiction of the U. S. District Courts and punishable by fine.

The details of the measure are too many to be included in these columns, but the implications are clear. Industry is to organize; the antiquated anti-trust act is to be shelved and the Federal Government is not only to allow open co-operation but actually to require it. This co-operation will include settlement of hours of labor, wage rates and the establishment of fair prices. It means, in a sense, Government regulation of practically all the elements in the operation of business, with teeth provided in the act to be used against the price-cutter and the "sweater." It may result in cutting general hours of labor toward the 30-hour week contemplated in the Black Bill, now sidetracked. It may include the raising of wages throughout each industry to provide additional purchasing power for the masses. It may include the setting of prices by the manufacturers to cover these increased costs.

Ten years ago such a measure would have been labeled at once "Communistic." The amazing thing is that today it evokes only wide discussion and difference of opinion. To be sure it has many opponents. That is to be expected, as it runs contrary to the long-established principles of individualism under which we have been living. Consequently, the National Association of Manufacturers opposes the plan. On the other hand, however, we find that the Chamber of Commerce of the United States favors the measure and offers to its members all possible assistance in complying with the terms of the Bill. Robert P. Lamont, former Secretary of Commerce and now president of the American Iron and Steel Institute, states that "the members of the steel industry are fully in sympathy with the purposes of the proposed bill." Of course, a long list of prominent names can be found on both sides of the question.

The fact to face, however, is not agreement or disagreement. It is that this bill is going through. It means that trade associations will be given power to work out their problems. It also means that if they do not make use of this power, they will be forced to do so by Federal authority or to go out of existence.

In a word it means that industry must put its house in order in accordance with the ideas of the administration. It will have the aid and backing of the Government and it must act.

Important Research Work in Danger

WE have received a communication from the Research Committee of the American Electroplaters' Society which is full of meaning for every worker and manufacturer in the electroplating industry. It seems that due to present economic conditions, the research fund is at such a low ebb that without assistance the Society will be unable to go on with the research into the corrosion resistance of electroplated metals which they have undertaken together with the American Society for Testing Materials and the U. S. Bureau of Standards. Seven thousand plated specimens are now on test at different locations in the United States. Numerous laboratory experiments are going on in Washington. Only one more year will be required to complete the project. To abandon it now would be to lose the large investment already made in this work.

It may not be generally known but it is a fact nevertheless that the amount of plate required to protect any given manufactured article is entirely a matter of conjecture. This research is the first broad, authoritative attempt to set standards for electroplating. The public is calling for products improved both in quality and appearance. This research will be of immeasurable help in meeting that demand.

The American Electroplaters' Society requires only

$4,000 per year to finance its project. They ask for contributions no larger than $25 from any individual or firm. They want the support of a large number. They should have it, because their project is for the good of the industry as a whole. We are confident that the manufacturers of plated products will not allow their research to be stopped.

Contributions should be sent to Walter Fraine, Secretary-Treasurer, 507 Grand Avenue, Dayton, Ohio.

Foundry Work Goes On

IN spite of the depression, now in its fourth year (from which we may be emerging if our present improvement continues), in spite of the troubled condition of industry abroad, in spite of unsettled financial and political developments, industry continues to press forward. One shining example is the foundry. One of the worst sufferers from our industrial troubles, one that has taken the heaviest buffets of fate, the attacks of depression, and even in good times, the attacks of other processes cutting into its field, the foundry still goes ahead to improve its products and reduce its costs.

At the coming meeting of the American Foundrymen's Association in Chicago, June 19-23, papers will be read and discussed of direct interest to the non-ferrous foundry, on leaded bronzes, bearing metals and beryllium copper castings. There will be a symposium on the deoxidation and degasification of bronze foundry alloys, such as valve bronzes, leaded bearing bronzes and tin bronzes. There will be a round table discussion of non-ferrous foundry problems without manuscripts, without stenographic reports and without restraint. Among the more general subjects applicable to non-ferrous foundry work to be brought up, are sand testing and cost finding.

The fortunate combination of Foundry Convention in the same city as the Century of Progress Exposition is an opportunity too valuable to be missed. Every foundryman who can get there should and will attend.

Plating Progress Shown at the Convention

A VERY comprehensive summary of the progress in electroplating was given by George B. Hogaboom, at a recent meeting of the Newark Branch of the American Electroplaters' Society, in which he described the recent developments in the plating industry. It was astonishing that even recent developments covered such a wide variety of work, including nickel on steel and die castings, nickel on aluminum, black nickel, acid copper with high current densities, electrolytic sheet copper, rolled copper anodes, the control of brass solutions especially for a deposit on steel to aid the vulcanizing of rubber onto metal, a new electrolytic zinc process using acid solutions under current densities of 500-700 amperes per sq. ft., silver under high current densities, the deposition of tin, bright cadmium, the deposition of alloy golds, rhodium, palladium, tungsten, and of course, the widely known chromium, the deposition of iron-nickel and other alloys, and so on.

We must bear in mind that the above list covers progress only within the past ten years. Why has the electroplating industry moved forward so fast? Partly because of the demand of large industries for improved protection and appearance. This was inevitably followed by increased effort on the part of the electroplaters. But these factors alone could not account for the rapidity with which the advance has been made. The speed is due largely to the rapid dissemination of information throughout the trade. It is due to the close contact between platers and chemists specializing in plating. It is due in a large measure to the educational work of such organizations as the American Electroplaters' Society.

This Society is meeting in Chicago, June 27-30. The program will include papers and discussions on the deposition of nickel, cadmium, tin and chromium, the cleaning of metals, etching, technical control of solutions, measuring the thickness of electroplates, stripping of plates, and so on. It is impossible to estimate the impetus given to the industry every year by these meetings. It is impossible to estimate the value of attendance at these meetings. To some it seems a vague gamble in futures but to the progressive manufacturer it is known to be a profitable investment to pay the expenses of his plating executive to the convention.

We repeat, the American Electroplaters' Society convention will be held in Chicago, at the Congress Hotel, from June 27 to June 30. It should not be missed.

"The Crystallization" of Metals

THERE are few subjects so old that they cannot bear occasional repetition. There are few fallacies so old that they have been completely eliminated from belief. Even in the technical trades, old misunderstandings and misapprehensions persist. Among these not the least is the idea that metals "crystallize" under vibration, and fail for that reason.

The source of this error is the simple fact that a fractured piece of metal exposes a break and shows clearly to the naked eye the crystal structure of the material, which is not evident from the commonly seen polished or even unpolished surface. Consequently the idea took hold that the metal broke only when and where it had become "crystalline."

The clearest exposition of the facts is given in Letter Circular 204 of the Bureau of Standards. It is, of course, a known fact that all commercially manufactured metal is made up of a mass of crystals. Fracture and failures caused by fatigue are due not to "crystallization," but to exceeding the stress that the material can endure. At stresses about the endurance limit, the damage begins, finally resulting in the formation of tiny cracks within the crystals. These cracks grow larger as the stress is repeated and finally cause failure.

Poor fillets, sharp corners, tool marks or grinding scratches, non-metallic inclusions as in "dirty" metal, corrosion, and rusting all encourage such local stresses. If, at any point, this local stress rises too high, damage will be done, which will ultimately develop a crack and cause failure.

Correspondence and Discussion

Zinc Plating Die Castings

To the Editor of METAL INDUSTRY:

We are very much interested in the answer to a subscriber's question on the plating of zinc die castings, which appeared on page 133 of your April issue. The writer has had a great deal of experience with the plating of die castings; experience which would prompt him to give an answer entirely different from that published.

The plating solution suggested is entirely workable but suffers by its self imposed restriction on maximum current density. This restriction, combined with the reference to a five or ten minute plate, allows for the deposition of a coating of nickel less than 0.0001 inch thick.

It has become increasingly evident that zinc, like other metals, requires more than a flash of nickel to provide a durable plated coating. R. J. Wirshing of the General Motors Research Laboratories claims that plated deposits on zinc should be 0.001 inch thick. E. A. Anderson and C. E. Reinhard of the New Jersey Zinc Company state that at least 0.0003 inch of coating is required. In the face of these statements, backed by experience of every large user of plated die castings, it is difficult to see any justification for the continued advocation of plating methods which simply cannot be expected to produce deposits of satisfactory durability.

A very satisfactory and widely used solution which permits more rapid deposition of heavy coatings is the following:

Nickel sulphate	10 oz.
Sodium sulphate $\cdot 10\,H_2O$	30 oz.
Ammonium chloride	2 oz.
Boric acid	2 oz.
Water	1 gal.

Use at room temperature with pH of 5.8-6.2 colorimetric. No strike is necessary if the solution is used at the maximum current density possible without burning. At this current density a plating time of about 20 minutes will be required to produce the minimum coating mentioned above.

The writer understands that if the nickel sulphate content is increased to 15 oz./gal., and the chloride content raised to 3 oz./gal. an even faster rate of deposition is possible.

The writer realizes that it is entirely possible that the request for information came from one who intended his product exclusively for indoor use where a thinner coating would be permissible. On the other hand, the generalized question and answer do not make this clear, and any uninstructed person would be entirely justified in believing that the information given applies to plating zinc for any exposure.

AN OLD SUBSCRIBER.

While there is some difference of opinion as to the method of nickel plating zinc die castings, there are several factors that must be considered when doing this class of work.

If the work is for outdoor use, a deposit of nickel, or copper and nickel, should be heavy enough to prevent atmospheric corrosion. If the work is for indoor use, the thickness of the deposit of nickel is not of such importance. Competition in prices for finishing this class of work is another item that cannot be overlooked at the present time, due to business conditions.

The sodium citrate nickel solution was used widely prior to the development of the sodium sulfate solution. I would consider its use today on work for indoor use in preference to the sulfate solution where the price is a determining factor in the cost of the work.

If the work is for out-door use, the sulfate bath would be preferable, although some manufacturers are depositing a heavy coat of copper, then coloring the copper, and nickel plating in the regular nickel solution, the combined deposits being 0.001 inch thick. This method increases the cost but produces a durable finish.

O. J. SIZELOVE.

New Books

Profit Engineering by C. E. Knoppel. Published by McGraw-Hill Publishing Company. Size 6 x 9; 320 pages Price $3.00.

This book is briefly, the presentation of a systematic, engineering procedure for recording and charting the cost of sales of manufactured articles, and a plan to follow in order to insure profits from those sales. The author describes and illustrates the "Profigraph," a chart which shows the various stages in the operation of a business, at what points it becomes profitable or unprofitable, the proper allocation of funds to various departments and the correct division of profits between dividends, surplus, reserves, etc.

An idea of the scope of the book can be gained from the chapter headings: Losses and Their Reasons; Importance of Financial Records in Profit Making; The Use of Graphics in Profit Making; Profit Planning Analagous to Production Planning; Calculating the Profit Requirements; Budgeting for Required Profits; Pre-Determining and Budgeting Allowable Costs; Control to Assure Profits; Economic Factors Governing Profit-Making.

Book of A.S.T.M. Tentative Standards—1932 Edition. Published by the American Society for Testing Materials, Philadelphia, Pa. 1,236 pages. Price $7-$8, depending upon binding.

The book of A.S.T.M. Tentative Standards is issued annually by the American Society for Testing Materials. Each year it includes all of the tentative standards in effect at the time of publication. The term "tentative" is applied to a proposed standard, which is given approval throughout the various steps of A.S.T.M. procedure, and which is published for one or more years to elicit comments and criticism, of which cognizance is taken before it is formally adopted and issued as an A.S.T.M. standard. Although in the trial stage, these tentative standards are in wide use due to their careful promulgation.

The 1932 Book of A.S.T.M. Tentative Standards includes all of the 226 tentative specifications, test methods, definitions of terms and recommended practices effective as of October 31, 1932. Of this number, 47 were accepted for publication for the first time in 1932. They include 20 for non-ferrous metals. Among these are the following kinds of zinc-coated (galvanized) wire and wire products: telephone and telegraph wire, tie wires, farm-field and railroad right-of-way-fencing, chain-link fence fabric galvanized after weaving, barb wire, and wire strand (cable). There is also given the recommended practice for safeguarding against embrittlement of hot-galvanized structural steel products and procedure for detecting embrittlement.

New specifications for non-ferrous products cover hard-drawn copper transmission cable, copper water tube, aluminum-copper-magnesium-manganese alloy bars, rods and shapes, and magnesium-base alloy sheet and wrought shapes.

Aluminum and Its Alloys. By N. F. Budgen, Ph.D., M.Sc. Published by Isaac Pitman and Sons, New York. 271 pages. Price $4.50.

The author of this book has adequately written an outline of the various branches of metallurgical work related to and comprising the aluminum industry. He discusses the properties and applications of aluminum, its alloys and the processes and methods employed in their production and manufacture. The treatment is necessarily technical, but it should be emphasized that this is not a textbook but a popular account of

the subject. The author's object has obviously been to produce a sound but wholly digestible handbook for the less technical reader who does not require undue amplification of the scientific details involved. In this purpose Mr. Budgen has succeeded admirably and the pages in this book are enlivened by a number of well-chosen and excellently reproduced photographs. The information provided in the book is likely to prove more than adequate for the average artisan who wishes to acquaint himself with the essential facts about the lightweight metal which is being used in the fabrication of an ever increasing variety of products and components.—A. E.

Standards Yearbook for 1933. Published by Department of Commerce, Washington, D. C. Size 6 x 9; 255 pages. Obtainable from the Superintendent of Documents, Washington, D. C. Price $1.00.

This is the annual compilation which describes the standardization activities and accomplishments, not only of the Bureau of Standards and other agencies of the Federal Government and the states and counties, but also those of the national technical societies and trade associations.

The book has already proved of great value to manufacturers, industrial experts, engineers and purchasing agents.

Technical Papers

A Chromium Plating Bath with the Fluoride Ion. By Alfred Perlenfein, Rennsselaer Polytechnic Institute, Troy, N. Y. Engineering and Science Series Bulletin 39.

Grinding, Polishing, Buffing Monel Metal and Pure Nickel. The International Nickel Company, Inc., 67 Wall Street, New York. Free. (Bulletin TS-5.)

The Diamond Review for 1932, by Sidney B. Ball, mining geologist. National Jewelers Publicity Association, Newark, N. J.

Determination of Lead, Copper and Manganese in Manganese Bronze, by James Brinn. "The Chemist-Analyst," March, 1933, pages 14-15.

Grain Boundary Effects as a Factor in Heterogeneous Equilibrium of Alloy Systems. By Arthur Phillips and R. M. Brick. Journal of The Franklin Institute, Philadelphia, Pa. Vol. 215, No. 5, pages 557-578, May, 1933. Price 60 cents.

Thermoelectric Properties of Platinum-Rhodium Alloys. By Frank R. Caldwell, Bureau of Standards. Research Paper No. 537. Superintendent of Documents, Washington, D. C. 5 cents.

Ancient Egyptian Antimony Plating on Copper Objects. By Dr. C. G. Fink and Arthur H. Kopp. Reprint from Volume IV, Part 2, March 1933, Metropolitan Museum Studies. Metropolitan Museum of Art, New York.

The Alkaline Earths and Their Uses. By Charles Hardy and Paul M. Tyler. Reprint from "Chemical Markets." Available from Hardy Metallurgical Company, 415 Lexington Avenue, New York.

Tentative Methods of Chemical Analysis of Metallic Materials for Electrical Heating (B 71—33 T). American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Price 25 cents for single copies.

Reference Tables for Platinum to Platinum-Rhodium Thermocouples. By Wm. F. Roeser and H. T. Wensel, Bureau of Standards, Department of Commerce, Washington, D. C. Available from Superintendent of Documents. Price, 5 cents.

The Activities of Mellon Institute during 1932-33. Industrial research in the present economic crisis. Reprint from Industrial and Engineering Chemistry of an abstract of the annual report of the director. Mellon Institute, Pittsburgh, Pa. Free.

Standard Samples. Bureau of Standards, Department of Commerce, Washington, D. C., has issued a Supplement to Circular No. 398, on Standard Samples Issued or in Preparation. This lists the samples and gives their prices. Numerous metals and products used in metal production and fabrication are included.

The authors in their work of restoring ancient bronze and copper articles discovered that a chemically applied plate of antimony existed on an Egyptian ewer and basin of about 2500-2200 B.C. The article describes in detail the way in which this plate was detected; also two methods of application of this plate, either of which the Egyptians might have used.

Abstract—These methods were recently approved for publication as tentative by our Standards Committee on the recommendation of A.S.T.M. Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys. The changes consist principally of a different method of solution, which in general provides at least as good accuracy as was previously obtained and the tests are more readily made and in a shorter time.

Abstract:—Reference tables for use with platinum to platinum-10 per cent rhodium and platinum to platinum-13 per cent rhodium therocouples have been prepared. When these tables are used, the deviation curves obtained for individual couples, have no points of inflection and are, with few exception, linear. These tables are based on the International Temperature Scale, so that the indications of a thermocouple whose calibration is obtained by extrapolation of a deviation curve above the gold point will agree in this region with those of an optical pyrometer.

Abstract—A chromium plating bath with chromic acid and sodium fluoride as an addition agent is feasible. The optimum conditions are a concentration of 250 grams of chromic acid per liter and 10 grams of sodium fluoride per liter, a temperature of 45° C., a current density from 15 to 65 amperes per square decimeter. A constant ratio between the fluoride and the chromic acid is not necessary. The concentration of the fluoride should not be less than 8 grams per liter. With these conditions the concentration of chromic acid may vary from 125 to 300 grams per liter. An impervious plate directly on iron was made at a current density of 31 amperes per square decimeter. From determinations of single potentials, the conclusion is drawn that only one ion is discharged at the respective electrodes and that these ions are the same as those discharged in the sulfate bath. The plating range of the fluoride bath is much wider than that of a standard sulfate bath. The minimum current density is higher than that for the sulfate bath. The fluoride bath gives a brighter plate.

Government Publications

United States Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, apply to governmental body responsible for publication.

Gold and Silver in 1932. Bureau of Mines, Washington, D. C. M. M. S. 198, preliminary annual summary.

Zinc in 1931. Bureau of Mines general report. Superintendent of Documents, Washington, D. C. 5 cents.

Coated Abrasive Products. Bureau of Standards. Simplified Practice Recommendation R 89-32. Superintendent of Documents. 5 cents.

Lead Industry in 1932. United States Bureau of Mines, Washington, D. C. Report M.M.S.190, advance summary of production and other statistics.

Brass or Bronze 250-Pound Unions. Federal Specifications Board, Washington, D. C. Proposed Federal Specification TS-1903. Sheet free from Board, which requests comment from interested parties.

Copper Wire Nails. Department of Commerce, Washington, D. C. Division of Simplified Practice has issued sheets for acceptance of SP-1843 on copper wire nails, for filling out by makers, distributors and users of the product.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Exhausting Chromium Fumes

Q.—Having been subscribers of your publication for several years, we would appreciate very much some technical information relative to the removal of fumes from a chromium plating unit. Also, if possible, we would like suggestions of practical literature that is available for determining volumes of air to be moved and capacity of units for doing this job.

For your information, we are procuring figures on a tank 4 feet long and 2 feet or 30" wide. In one instance, it is recommended that we use a 1" opening to take the fumes off the surface and another source of supply recommends a 2" opening. Where the difficulty comes in, is in the blowers. A 12" diameter wheel with a 1½ horsepower motor at 1,120 R. P. M. has been recommended by one source of supply, while another recommends nothing else than a 15" inlet and outlet with a 2½ horsepower motor if connected direct or a 1½ horsepower motor if using a texrope drive, the motor revolution being 1,750 and reduced at the blower to 850 R. P. M.

For your information, the fumes must be carried a distance of 8 feet upward around an elbow and approximately 10 feet around another elbow and out. Kindly advise us, if possible, the actual requirements that will successfully take these fumes away, as this divergency of opinion has caused us to be more or less wary as to the unit we are going to install.

A.—In removing the chromic acid fumes from a chrome plating solution a static pressure of one-half inch should be had. To obtain this pressure the size of the tank, the size of the openings and the resistance in the outlet pipe due to bends must be considered.

With the size of tank you intend to install a one inch opening on all sides will be necessary. An exhaust of 2,200 cubic feet of air per minute will be necessary to maintain a static pressure of one-half inch. If the outlets had no resistance from the elbows, a 1½ horsepower motor would be sufficient, but due to the two elbows, it would be best to install the 2½ horsepower motor if connected direct.

The manufacturers of exhaust blower equipment have illustrative catalog which should be of some help to you in determining the volume of air to be removed and also the capacity of the units.

O. J. S., Problem 5,203.

Eliminating Nickel Carbonate

Q.—We are asking for a little advice and refer you to the copy of Platers' Wrinkles, which we received about two years ago, in regard to plastic carbonate of nickel, top of page 7. The third sentence reads: "After precipitation, filter carefully and rewash with hot water several times". We find that only clear liquid passes through the filter which immediately becomes clogged. We then permitted the mixture to rest and poured off the clear liquid from the top of the precipitate; this operation was repeated several times. Adding the proportional amount to a sample of the nickel plating bath, we find that this precipitate fails to dissolve.

If we have performed this operation correctly, we would like to

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date.....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.:.....**Cathode surface, sq. ft:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:**.....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

know if the carbonate of nickel will be removed as soon as we filter the bath which we do from time to time.

A.—It is extremely difficult to filter carbonate of nickel unless a special filter paper is used. It is usually customary in preparing the carbonate of nickel to siphon off the clear liquid, then add water and continue operations until when tested with a solution of barium chloride, there is not produced a precipitate of barium sulphate.

Carbonate of nickel is insoluble in a nickel solution unless there is present enough acid to dissolve it. It is usually placed in a muslin bag which is suspended into the nickel solution and in this way it would not be removed by filtration.

O. J. S., Problem 5,204.

Nickel and Zinc Solutions

Q.—We are sending samples of our nickel and zinc solutions. The nickel solution seems to work fairly well for most work, but is not suitable for the plating of hard steel. We would like to know whether this trouble is due to the solution or not.

The zinc solution has stood for a number of months without being used. We would like to know whether it should be diluted, and whether anything can be added to it in order to produce better throwing properties.

A.—Analysis of nickel solution:

Metallic nickel	7.71 ozs.
Chlorides	1.70 ozs.
pH	5.2

The metal content is too high and the chloride content and the pH are too low. Take one-half of the solution from the tank and replenish with water. Then add to the solution 25 lbs. of sodium chloride, 34 fluid ozs. of 26° ammonia and ½ gallon of 100 volume hydrogen peroxide. After making this correction, stir solution thoroughly and let stand over night before using.

Acid zinc solution:

Metallic zinc	11.30 ozs.
Ammonium chloride	2.62 ozs.
pH	2.4

Take 1/3 of the solution from the tank, then replenish with water and add 2 ozs. of ammonium chloride to each gallon of solution.

O. J. S., Problem 5,205.

Plating Wood and Paper

Q.—I have tried to plate some wood and paper articles, tried to follow different instructions which I read, but as yet I have not had any success, so am going to ask a few questions.

Is all lacquer cellulose lacquer? Is yellow colored bronze the same as plater's copper bronze? Does it require a special kind of shellac?

I have soaked them in paraffine for one-half hour, then shellacked them, then gilded them, but so far have been unable to plate them in the acid copper, which makes me believe, I am wrong in preparing them some way.

Would I be able to get such articles out on production, or would there be considerable difficulty attached to it? Also, would the surface be smooth and bright, or would they have a satin finish?

A.—We believe that the difficulty you are having in plating wood and paper articles is due to improper methods of preparing the surface. Articles that are porous should be soaked in hot paraffine wax to close the pores and make them impervious to the plating solutions. After treatment in paraffine, they are sprayed or brushed with shellac and left to dry thoroughly before being sprayed with the copper bronze powder.

Either the white or yellow shellac will do, and the lacquer should be one that does not contain any gum. The yellow bronze powder should not be used. A special plater's copper bronze powder should be used and this may be purchased.

You should be able to do production work with this method and if the copper deposit is heavy enough it may be polished to produce a smooth surface.

O. J. S., Problem 5,206.

Rust-Resisting Nickel Plate

Q.—We are sending you by express prepaid two samples of Solution No. 1 nickel, and No. 2 cyanide copper solution. Both solutions were made up four months ago. The following formulae were taken out of the Platers' Guidebook.

Nickel tank	120 gal.
Double Nickel Salts	8 ounces
Single Nickel Salts	8 ounces
Sodium Chloride	3 ounces
Boric Acid	3 ounces
Water	1 gallon
Copper tank	100 gallons
Copper Carbonate	5 ounces
Sodium Cyanide	10 ounces
Hyposulphate of Soda	½ ounce
Water	1 gallon

The trouble with the plating is that it is not rust-proof. I am only putting out nickel plating work. I had a man working with me when we mixed the solutions and we put ½ lb. hyposulphite of soda for the 100 gallon tank which is 5 ounces too much. The solution is down to 93 gallons; that is, evaporation is 7 gallons. I think the trouble is in the copper solution. I would like to know if it will pay to dope it up or throw it away.

A.—Analysis of nickel solution:

Metallic nickel	3.52 ozs.
Chlorides	1.95 ozs.
pH	5.8

Cyanide copper:

Metallic copper	3.44 ozs.
Free cyanide	1.54 ozs.

Both solutions are in good operating conditions and satisfactory results should be obtained providing proper current densities are used.

We feel confident that you can produce a rust proof plate if you will nickel plate, then copper plate, and then nickel plate providing the deposits are thick enough. Each deposit should be at least .001 inch thick.—O. J. S., Problem 5,207.

Spotted Brass

Q.—I am plating brass on cast iron and am having trouble with staining. The work comes out of the tank a perfect brass, but when it stands around a while it stains very badly; that is it changes to all colors, but mostly dark and does not look like brass at all. It is very hard to bring back the color by scratch brushing.

Now I would like to know if there is a way to prevent this. I thought there might be something that I could put in my hot rinse water that would stop that.

A.—Your trouble, "spotting out", is one that is quite common, particularly at this time of the year when the humidity is high.

The only way to eliminate some of the trouble is to bake the work for 24 to 48 hours at a temperature of 350° F., before finally finishing the work.

When the work is finished, if possible, it should be coated with a film of wax and wrapped in wax paper to prevent a re-occurrence of the spotting.—O. J. S., Problem 5,208.

Streaky, Pitted Nickel

Q.—Am sending you sample of nickel solution. I would appreciate very much to have this analyzed, and told what to do to correct same. Work streaks, with no plate in streaks; also, bottom piece on wire has a tendency to pit.

A.—Analysis of nickel solution:

Metallic nickel	2.28 ozs.
Chlorides	.85 oz.
pH	6

The chloride content of the solution is too low. Add 1½ ozs. of sodium chloride to each gallon of solution. Add hydrogen peroxide to the solution to overcome the pitting and see that proper current density is used.—O. J. S., Problem 5,209.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,904,107. April 18, 1933. **Electroplating with Aluminum.** Alfred von Zeerleder, Neuhausen, Switzerland, assignor to Aluminium Industrie Aktiengesellschaft, Neuhausen, Switzerland.

1,904,146. April 18, 1933. **Wire Drawing Apparatus.** Einer W. Larsen, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,904,147. April 18, 1933. **Wire Drawing Machine.** Einer W. Larsen, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,904,159. April 18, 1933. **Wire Drawing Machine.** Edwin J. McIlvried, Cleveland, Ohio, assignor, by mesne assignments, to Western Electric Company, Incorporated, New York, N. Y.

1,904,175. April 18, 1933. **Cadmium-Nickel Alloy.** Carl E. Swartz, Highland Park, and Albert J. Phillips, Metuchen, N. J., assignors to American Smelting and Refining Company, New York, N. Y.

1,904,176. April 18, 1933. **Cadmium-Nickel Alloy.** Carl E. Swartz, Highland Park, and Albert J. Phillips, Metuchen, N. J., assignors to American Smelting and Refining Company, New York, N. Y.

1,904,232. April 18, 1933. **Wire Drawing Apparatus.** Carl R. Hoffman, Berwyn, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,904,273. April 18, 1933. **Method of Producing an Article of Manufacture.** Henry L. Crowley, East Orange, N. J., assignor to Henry L. Crowley & Co., Inc., East Orange, N. J.

1,904,274. April 18, 1933. **Grinding Apparatus.** Henry L. Crowley, East Orange, N. J., assignor to Henry L. Crowley & Company, Inc., West Orange, N. J.

1,904,282. April 18, 1933. **Polishing Apparatus, Specially for Knives, Forks, and Spoons.** Robert Ern, Solingen, Germany.

1,904,360. April 18, 1933. **Brazing Solder.** August M. Dinkler, Waterbury, and Cyril Stanley Smith, Cheshire, Conn., assignors to The American Brass Company, Waterbury, Conn.

1,904,389. April 18, 1933. **Brazing Solder.** Cyril Stanley Smith, Cheshire, Conn., assignor to The American Brass Company, Waterbury, Conn.

1,904,419. April 18, 1933. **Lead Extrusion Apparatus.** Frank L. Davis, Jr., Kenilworth, N. J., assignor to The Watson-Stillman Co., Roselle, N. J.

1,904,616. April 18, 1933. **Method of Soldering.** Georg Brunhübner, Pforzheim, Germany, assignor to Ernst Gideon Bek, Pforzheim, Germany.

1,904,684. April 18, 1933. **Method of Melting.** Albert E. Greene, Medina, Wash.

1,904,706. April 18, 1933. **Process of Heat Treating Metals.** Arthur E. Bellis, Branford, Conn.

1,904,732. April 18, 1933. **Alloy Plated Iron and Steel and Process of Making the Same.** Batist R. Haueisen and James C. Patten, Indianapolis, Ind.; said Haueisen assignor to said Patten; Margaret Lucile Patten executrix of said James C. Patten, deceased.

1,904,761. April 18, 1933. **Production of Alloys.** Donald M. Scott, Buffalo, N. Y., assignor to Buffalo Electric Furnace Corporation, Buffalo, N. Y.

1,904,853. April 18, 1933. **Method of and Apparatus for Preparing and Handling Molten Materials.** Herbert F. Carter, Roselle Park, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,904,907. April 18, 1933. **Method and Apparatus for the Extrusion of Metal.** William Travis, Blackley, Manchester, England.

1,905,105. April 25, 1933. **Electrodeposition of Tin-Gold Alloys.** HaroldJ. Kersten, Cincinnati, Ohio, assignor to Board of Directors of the University of Cincinnati, Cincinnati, Ohio.

1,905,106. April 25, 1933. **Electrodeposition of Zinc-Gold Alloys.** Harold J. Kersten, Cincinnati, Ohio, assignor to Board of Directors of the University of Cincinnati, Cincinnati, Ohio.

1,905,204. April 25, 1933. **Apparatus for Pouring Molten Metal.** Frank D. Zinno, Waterbury, Conn., assignor to The Chase Companies, Incorporated, Waterbury, Conn.

1,905,312. April 25, 1933. **Beryllium Aluminum Alloy.** Joseph Kent Smith, Detroit, Mich., assignor to Beryllium Development Corporation, New York, N. Y.

1,905,313. April 25, 1933. **Beryllium-Aluminum.** Joseph Kent Smith, Detroit, Mich., asignor to Beryllium Development Corporation, New York, N. Y.

1,905,314. April 25, 1933. **Copper Alloy.** Joseph Kent Smith, Detroit, Mich., assignor to Beryllium Development Corporation, New York, N. Y.

1,905,445. April 25, 1933. **Alloy.** Ernst de Ridder and Hubert Altwicker, Bitterfeld, Germany, assignors, by mesne assignments, to Magnesium Development Corporation, a Corporation of Delaware.

1,905,809. April 25, 1933. **Method of Preventing Oxidation of Metals During Heat Treatment.** Roysel J. Cowan, Toledo, Ohio, assignor to Surface Combustion Corporation, Toledo, Ohio.

1,905,810. April 25, 1933. **Low-Temperature Bright-Annealing.** Roysel J. Cowan and Orville E. Cullen, Toledo, Ohio, assignors to Surface Combustion Corporation, Toledo, Ohio.

1,905,959. April 25, 1933. **Metal Coated Material.** Leonard Walter Cutler and Carl Adolphe Klein, Enfield, England, assignors, by mesne assignments, to Goodlass Wall and Lead Industries, Limited, London, England.

1,905,968. April 25, 1933. **Method and Apparatus for Cleaning Articles, Particularly Metallic Goods.** Kenneth James Rennie Robertson, London, England, assignor to Carrier Engineering Company, Limited, London, England.

1,906,154. April 25, 1933. **Process for Coating Metal Objects.** Bernard Hemann, Ashland, Ky.

1,906,168. April 25, 1933. **Process of Decorating Metals.** Veuve F. Malleval, neé Berthe Burlet, Paris, France.

1,906,178. April 25, 1933. **Preparation and Operation of Platinum Plating Baths.** Alan Richard Powell, Emyr Conway Davies, and Arthur William Scott, London, England, assignors to Johnson Matthey & Company, Limited, London, England.

1,906,184. April 25, 1933. **Method of Reducing Metal Oxides.** Wilhelm Rohn, Hanau, Germany, assignor to Heraeus-Vacuumschmelze A-G., Hanau-on-the-Main, Germany, a Germany company.

1,906,192. April 25, 1933. **Metal Alloy.** Charles Vangrevenynge, La Celle-St. Cloud, and Henry Elion, Paris, France.

1,906,190. April 25, 1933. **Surfacing Tool.** Herbert E. Tautz, Milwaukee, Wis., assignor to Delta Manufacturing Company, Milwaukee, Wis.

1,906,378. May 2, 1933. **Anode Support.** Henry C. Howard, Akron, Ohio, assignor to American Anode, Inc., Akron, Ohio.

1,906,388. May 2, 1933. **Spray for Coating Molds.** James F. McClintic, Detroit, Mich., assignor to General Motors Research Corporation, Detroit.

1,906,400. May 2, 1933. **Apparatus and Process for Conveying Coated Articles from a Galvanizing Tank.** John W. Moon, Butler, Pa., assignor, by direct and mesne assignments, to Fretz-Moon Tube Company, Inc., Butler, Pa.

1,906,557. May 2, 1933. **Furnace Lining.** George David Evans, Baltimore, Md., assignor to American Smelting and Refining Company, New York, N. Y.

1,906,567. May 2, 1933. **Metal Alloy.** Arthur Fritschle, St. Louis, Mo., assignor to Owens-Illinois Glass Company, a Corporation of Ohio. Oct. 17, 1931.

1,907,041. May 2, 1933. **Apparatus for Working Metal.** George B. Coe, Waterbury, Conn., assignor, by mesne assignments, to Tube Reducing Corporation, Wilmington, Del.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

New Spray Gun

For companies which finish their products by the spray method a new gun is offered, the DeVilbiss Type MB spray gun. This gun contains the patented, exclusive DeVilbiss features which have long been in use and now are said to be further improved, in addition to many new features, chief of which are the new air trigger to insure easier operation, and (2) the new unrestricted air passage to give better atomization.

New DeVilbiss Spray Gun

The new DeVilbiss trigger gives "feather touch" control, said to insure perfect balance and effortless operation. Shorter trigger movement makes it unnecessary to stretch for the trigger. It is claimed that operators have used the MB gun for as long as nine consecutive hours without experiencing arm, hand or finger fatigue and that they now find it entirely natural to shut off the gun at the end of each stroke.

The unrestricted air passage on the MB gun allows a greater volume of air in the head and as a result, and therefore, it is claimed, atomization at a lower air pressure, and a smoother, more even finish obtained.

New Temperature Controller

A new temperature controller for industrial purposes has been developed by the Bristol Company of Waterbury, Conn. It is called Pyrometer Controller Model 478 for temperatures up to 3000 degrees F. The following features are given:

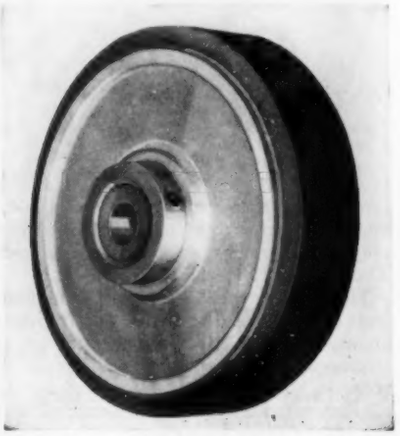
Mercury switches (no open contacts); no relays required; accessibility; visible operation; safety latch; compact rectangular case; special safety features; no routine maintenance required.

The instrument can be used for single circuit, 2 circuit, 3 or more circuit control. Enclosed wiring terminals.

Expanding Polishing Wheel and Endless Abrasive Bands

The Cleveland Container Company, Abrasive Division, Cleveland, Ohio, recently developed the seamless abrasive sleeve and expanding polishing wheel shown in the accompanying illustrations.

The wheel comprises two accurately machined and balanced forged aluminum clamping collars which are set together by a nut which screws up on the hub. The collar peripheries are tapered toward the center and bear against a heat resisting rubber filler, the internal diameter of which is provided with a double taper to fit the flanges. Thus, when the collars are



New Abrasive Sleeve

brought together, the rubber filler expands to hold an endless abrasive sleeve firmly in place.

The abrasive sleeves are made of preshrunk heavy cloth, coated with abrasive. The abrasive cloth is wound in place spirally by means of special machinery so that the resultant sleeve has no projecting joints. It is said that the absence of projecting joints results in a smooth, even contact with the work. As the sleeves are reinforced with a heavy cloth backing, they do not stretch in use and thus remain firmly in place until worn out. The wheels and sleeves are made in various sizes to meet various polishing requirements.

The company offers Bulletin A-100 giving full details of this development.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Cadmium Plating as a Substitute for Tinning Prior to Soldering. Udylite Process Company, Detroit, Mich.

Remote Bulb Temperature Controllers. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

Electric Clock Thermostat. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

X-Ray Paper. For industrial use to replace the celluloid film at one half the price. St. John X-Ray Service Corporation, Long Island City, N. Y.

Electrically Heated Air and Material Airbrush. Used for applying paraffin, cement, asphalt, waxes, etc. Paasche Airbrush Company, Chicago, Ill.

Modutrol Motor. For the control of heat, cold, humidity or fair flow. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

Primary Control Unit. An instrument for the immediate breaking of a safety circuit upon the appearance of flame. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

Indicating Temperature Controllers. For air, gases or liquids in ducts, ovens, tanks, vats, pipes, etc. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

Corrosion and Stain Resisting Screen Metal. A screen made of Inconel containing 80 nickel, 12-14 chromium, 6 iron. International Nickel Company, New York.

Heavy Duty Roll Grinder for Finishing Metal Rolls. A 60 in. x 20 ft. heavy duty grinder recently completed for one of the large midwestern plants. Farrel-Birmingham Company, Inc., Ansonia, Conn.

Alloy Resistant to Hydrochloric Acid. A high silicon iron alloy which stands up against hydrochloric acid at all concentrations and all temperatures up to the boiling point. Duriron Company, Inc., Dayton, Ohio.

Alundum Rubber Bonded Safety Treads. A new type of tread for use in industrial plants and factories, composed of alundum aggregate bonded in a reinforced base of hard, tough rubber. Norton Company, Worcester, Mass.

Turbine Pumps. A new line of turbine pumps suitable for handling even small quantities of liquids efficiently at high heads. Capacities, from 5 to 300 gallons per minute at heads up to 350 feet. Roots-Connersville-Wilbraham, Connersville, Ind.

Fractional Horsepower Gear-Motors. A line of fractional horsepower gear-motors with the characteristics and construction of the latest designs of general purpose motors. General Electric Company, Schenectady, N. Y.

Thermoguard Motors. A line of motors having a built-in disc thermostat that functions before the temperature of the insulation reaches the danger point. Westinghouse Electric and Manufacturing Company, E. Pittsburgh, Pa.

Swaging Machine for Pointing Rods

The machine illustrated, just completed by the Langelier Manufacturing Company of Providence, R. I., for one of the country's largest brass producers, is used for pointing copper and nickel silver rods preparatory to a drawing operation, to permit threading the stock through a die for gripping by the jaws. Three sets of dies were furnished to reduce ¾", 13/16" and ⅝" stock about .150" per pass for a length of 12". The production averages about 400 ends per hour.

The machine is one of the latest design Timken Bearing swagers and is equipped with a pressure feed system for lubricating the operating parts in the head. As a wide range of sizes will be handled the cover used to retain the dies in position is made for quick removal and a flywheel brake is furnished to stop the rotation of the spindle immediately and thereby keep to a minimum the time required for changing tools.

The drive is from a 15 H.P. motor

Langelier Swager

through a set of Vee belts and grooved sheaves, the motor being mounted on a bracket attached to the base of the machine.

The floor space required is 52 x 60, the overall height is 56" and the weight approximately five tons.

Heavy Duty Refractories

McLeod and Henry Company, Troy, N. Y., manufacture a line of high temperature fire cements, plastic refractories and refractory bricks under the trade name "Steel Mixture." This material, it is claimed, is highly suitable for non-ferrous metal furnaces. The bricks are made in a variety of shapes and sizes suitable for all conditions.

This company also makes silicon carbide refractories under the name Carbex, in a variety of styles and shapes, which feature exceptional smoothness and great density.

A New Instrument—The Resistometer

The Resistometer made by the Thwing Instrument Company of Philadelphia, Pa., is used for checking and calibrating any electrical resistance thermometers and electrical resistance thermometer bulbs. It is a combination wheatstone bridge and resistance measuring instrument, with features arranged so that resistance instruments may be checked for calibration and resistance thermometers may also be checked for calibration. The Resistometer

Thwing Resistometer

is used also to advantage for any application for which Wheatstone bridges and resistance measuring instruments are used. The present range is 1000 ohms.

The Resistometer is said to be simplified and easy to use and that no technical knowledge is required to operate the instrument. A few practical and simple directions furnished with the instrument are all that any one requires to secure successful results.

The Resistometer provides a scientific method that enables a technical man to do all the necessary work of checking resistance thermometers and resistance thermometer bulbs in the laboratory, and enables non-technical men to actually do the work of checking directly where the instruments are used in the plant. It is fully guaranteed.

Temperature Controls

A wide line of temperature control devices are made by the Partlow Corporation, New Hartford, N. Y. These controls are suitable for use on gas fired ovens of all kinds, metal pots, etc., such as for japanning, lacquering, core baking, type melting, etc. The controls operate between limits of 100 to 900 degrees F., and are suitable for all kinds of gas.

The illustration shows the Partlow temperature control No. 40 for use under pressures up to 1 pound maximum.

Some of the new products which the Partlow Corporation has put out are a Model F B safety gas valve, applicable to any pilot burner; a Model G B safety gas valve; an electric temperature control, Model L, for indicating temperatures and controlling flow of gas, oil and steam when used with motor operated or sole-

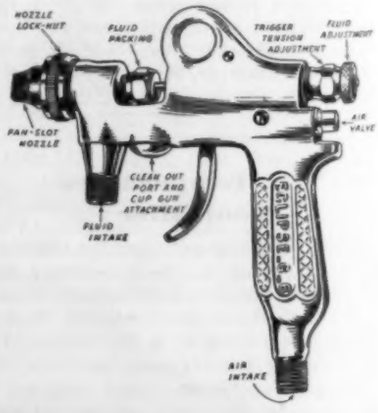
Partlow No. 40 Control

noid valves, and for maintaining temperatures and controlling electric heating units or relays, and starting and stopping motors automatically.

New Airbrush

The Eclipse G-6 air brush is made by the Eclipse Airbrush Company, 77 Orange Street, Newark, N. J. It is to be fitted with a wide variety of nozzles and fluid tips to suit all classes of work. Low air pressure is used which results, it is claimed, in freedom from spatter, wasteful fumes and fog. A number of other features are included in the gun, such as a variable trigger pull adjustment, accessible fluid plunger packing, fan slot nozzle control, removable air valve, etc.

The gun is recommended for use with special lacquers and enamels.



New Eclipse Airbrush

Equipment and Supply Catalogs

Available free on application to the manufacturers mentioned, unless otherwise stated. Please mntion this notice.

Cleaners. Philadelphia Quartz Co., 121 S. Third St., Philadelphia, Pa. Leaflet on sodium metasilicate.

Standard Trade and Securities. Standard Statistics Company, Inc., 345 Hudson Street, New York. Data on metal industries in relation to security values.

Felt Wheels. Lea Manufacturing Company, Waterbury, Conn., distributor for Bacon Felt Company, Winchester, Mass. Leaflet.

Udylite. Udylite Process Company, 3939 Bellvue Avenue, Detroit, Mich. April issue of the "News." Cadmium plating information.

Graphite Lubricant. Acheson Oildag Company, Port Huron, Mich. Technical Bulletin 102.4.

Vulcalock Valve. The B. F. Goodrich Rubber Co., Akron, Ohio. Bulletin 9787. New type rubber-lined valve for corrosive and abrasive fluids.

Heating Elements. Harold E. Trent Company, 618 North 54th Street, Philadelphia, Pa. Leaflet TB 30. Elements and units for various types of industrial equipment.

General Electric Company, Schenectady, N. Y., publications: Portable Cable, heavy; Sound-isolating Motor Bases; Quiet Induction Motors.

Scovill Brass Book. Scovill Manufacturing Company, Waterbury, Conn. Complete illustrated mill products catalog of 34 pages. Contains descriptions and valuable data tables.

Personals

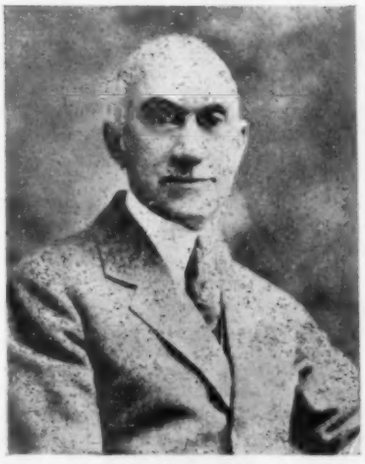
Foundrymen Award Medal to G. H. Clamer

Two new marks of distinction have just been conferred upon Guilliam H. Clamer, president of Ajax Metal Company of Philadelphia, Pa. For his outstanding achievements in the science of metal casting, the American Foundrymen's Association has awarded him the Joseph S. Seaman Gold Metal, which will be presented to him during the annual business meeting of the Association at its 1933 convention in Chicago this month. On June 5, the honorary degree of Doctor of Science was conferred upon him by Ursinus College, Collegeville, Pa., for his position and achievements in the scientific field.

Mr. Clamer has been associated with the advancement of metal casting, particularly nonferrous metals, for nearly 40 years. Under his executive direction many valuable improvements in melting and casting practice have been developed. Constantly active in the activities of technical societies allied with the foundry industry, he is a past-president of the American Foundrymen's Association and a life member of its Advisory Board.

Born in Philadelphia, June 9, 1875, Mr. Clamer attended public schools there and received his technical training first in that city's Manual Training School and later at the University of Pennsylvania. Further early training was received in the private chemical laboratory of Dr. F. A. Genth, a noted mineral chemist.

On graduating from the university in 1897 with a B.S. degree in chemistry, Mr. Clamer established a chemical laboratory at the Ajax Metal Company, Philadelphia, with whom he has been associated ever since. He was one of the first, if not the first, chemist to be regularly employed in the nonferrous foundry industry. On taking up this virgin field he became engaged in analyzing competitors' alloys (then secret), developing the scientific use of



G. H. CLAMER

scrap based on analysis, checking purchases of materials, and working out systems of manufacturing control and product check.

Later he was instrumental in developing numerous high-lead, high-strength and special alloys for many types of service requirements, as well as ferrous alloys and copper-nickel steels, the latter used during the World War in the manufacture of shells, gun-carriage castings, etc. In improving upon methods of employing scrap metals, Mr. Clamer's experiments led to invention of a refining process in 1901 for which he received the Elliot Cresson Gold Medal of the Franklin Institute. Still later, under his executive direction, his company developed several improved types of furnaces for nonferrous metal melting, especially electric induction furnaces.

Long active in association work, Mr. Clamer was the first nonferrous member of the American Society for Testing Materials and is a past-president of it. He was influential in setting up their first nonferrous committee, and has prepared numerous papers on alloys, metallurgy and melting equipment for various technical groups and trade papers.

As further evidence of his participation in association work, he is a past-president of the American Institute of Metals and of the Mining and Metallurgical section of Franklin Institute; member board of managers, Franklin Institute on Science and the chairman, Commiteee on Science and the Arts; charter member, American Electrochemical Society; member, American Institute Mining and Metallurgical Engineers, American Society for Steel Treating, American Institute of Electrical Engineers; member, Nonferrous Technical Advisory Committee of the Bureau of Standards for nearly 20 years; member, British Iron and Steel Institute; and one of the original American members of British Institute of Metals.

Mr. Clamer was the A.F.A. appointee to represent the nonferrous foundry industry in contact on technical matters with the United States government during the war. He also was vice-president of the war service association of manufacturers of solder and babbitt metal. Today, besides his connection with Ajax Metal Company, he is president and general manager of the following: Ajax Electric Furnace Corporation, Ajax Electrothermic Corporation, and Ajax Electric Company, Inc.

Alfred C. Rantsch has been appointed engineer in charge of die cast sales promotion for AC Spark Plug Company, Flint, Mich., a General Motors division.

Charles H. Proctor, well known in the electroplating industry, will leave about July 4 for a health and pleasure trip through Central and South America, with Mrs. Proctor and their son, Harry.

A. A. Johnson is now chairman of the board of Sparta Foundry Company, Sparta, Mich. **T. E. McFall** is now president; **H. G. Vaugh, D. W. Atkinson** and **I. E. McGowan** are vice-presidents; Lou Keller is secretary.

Fred E. Wolf has been appointed Pittsburgh district sales engineer for W. W. Sly Manufacturing Company, Cleveland, Ohio, makers of foundry equipment, dust arresters, etc. Mr. Wolf has had 17 years' experience with blast cleaning and dust collection.

Dr. E. R. Rykenboer has been appointed general manager of The R. & H. Chemicals Department of the du Pont Company to succeed C. K. Davis, who was recently elected president and general manager of Remington Arms Company, Inc. **Milton Kutz** has been appointed assistant general manager.

L. D. Dodson is now in charge of the New York office of The J. B. Ford Sales Company, Wyandotte, Mich., makers of industrial cleaners. Mr. Dodson has been at the Wyandotte office for several years. **Mr. Gline,** former New York Manager, is handling special work on national accounts with headquarters in New York. **R. D. Sherwood,** formerly Cleveland manager, will replace Mr. Dodson at Wyandotte. **G. T. Robinson,** formerly assistant manager at Cleveland, is now manager there.

Obituaries

Norman F. Thompson

Norman Frederic Thompson, Jr., 49, president of the Gilbert Clock Company, Winsted, Conn., died at New Haven Hospital on April 2, 1933, of septic sore throat, after a six weeks' illness.

Mr. Thompson was born in Rockford, Ill., and was educated at Hotchkiss School and Yale University. He entered the employ of the Burson Knitting Company, Rockford, in 1906, and became secretary, treasurer and president. In 1925 he sold his interests there and went to Winsted, where he bought control of the Gilbert company.

He was a former president of the Winsted Manufacturers' Association; representative in the legislature from Colebrook, Conn., in 1927; director of the Hurlbut National Bank and Winsted Hosiery Company of Winsted; and former vice-president of the Clock Manufacturers' Association of America. He is survived by his widow and three children.

W. R. B.

Samuel B. Jacobs

Samuel B. Jacobs, president of the Vulcan Ingot Metal Company, North Chicago, Ill., manufacturers of brass and bronze ingots, and secretary and a director of the Silica Brick and Engineering Company, Chicago, died April 17, 1933, of heart disease. He was 62. Mr. Jacobs was widely known in the metal trade, and was a very active North Chicago business man. He is survived by Henry Jacobs, his associate in the Vulcan company, two other brothers, and two sisters.

Charles P. Kuehner

Charles P. Kuehner, owner of O. Kuehner and Company, Providence, R. I., jewelry manufacturers, died May 3, 1933, aged 58, after a year's illness. Mr. Keuhner came from Germany 51 years ago. He was a member of the Providence Engineering Society and the Chamber of Commerce. He is survived by his widow, Mrs. Ottilie B. Keuhner.

Walter O. Jacobs

Walter O. Jacobs, president of the Central Electrotype Foundry Company, Newark, N. J., died May 8, 1933, aged 60, of heart disease. A native of Newark, Mr. Jacobs was at one time publisher of "The Vailsburgh News." He founded the electrotyping plant in 1903, and in 1909 he developed the amalgtype plate. He is survived by his widow, a son and a daughter.

Le Roy Seidell

Le Roy Seidell, president of the New York Testing Laboratories, New York City, died April 20, 1933.

Alfred Nathan

Alfred Nathan, president of the Nathan Manufacturing Company, New York, brass appliance manufacturers, and an officer in several other industrial concerns, died last month.

The son of the late Max and Rosalie Stettheimer Nathan, he was born in New York 66 years ago. After being privately tutored, he attended Stevens Institute of Technology, graduating in 1890 as a mechanical engineer. He succeeded his father as president of the Nathan Company in 1908.

Mr. Nathan was a member of the American Society of Mechanical Engineers, and several clubs.

Surviving are his widow and a son, Alfred Nathan, Jr., vice-president of the Nathan firm.

George McAvity

George McAvity, president of T. McAvity and Sons, Ltd., large Canadian brass manufacturers, died at St. John, N. B., April 25, 1933, of pneumonia. Mr. McAvity was 79, the next to the last of six McAvity sons of the company's founder. His company was widely known in the Dominion for its contributions to the mechanical equipment of railway locomotives throughout the world. He took a leading part in the industrial development of St. John.

Herman E. Frentzel

Herman E. Frentzel, chief mechanic of the Falk Corporation, Milwaukee, Wis., died April 12, 1933, aged 68 years. He was with Falk for 22 years. Previously he had been shop superintendent for the Harnischfeger Corporation for 20 years, and for some years was a partner in Julius Busch Company, Milwaukee, general machinists.

George H. Cahoone

George H. Cahoone, president of the Providence, R. I., jewelry manufacturing company that bears his name, died there May 17, 1933, aged 73 years. Widely known in the jewelry industry, he was also very active in a number of other lines of business, and held bank and insurance company directorships.

Walter E. Dean

Walter E. Dean, founder and president of the Dean Brass Foundry, Atlanta, Ga., died March 2, 1933. Mr. Bean was with the Southern Agricultural Works for many years before he went into business for himself.

Mason T. Adams

Mason T. Adams, vice-president and general manager of Seth Thomas Clock Company, Thomaston, Conn., died at his Waterbury home on May 4, 1933, aged 55 years.

Mr. Adams was born in New York and educated at Yale and the Columbia School of Mines. After various mining engineering connections in Mexico, Canada and the United States, he went to Seth Thomas in 1913 to take the executive position he held until his death, and since Seth Thomas died last year he had been the official head of the company. For a time, also, he was president of Beardsley and Wolcott Manufacturing Company, Waterbury. He was a director of the General Time Industrial Corporation, and of the Thomaston National Bank.

Mr. Adams is survived by his widow and two daughters.

W. R. B.

M. J. Connors

M. J. Connors, for 19 years plater of the Royal Typewriter Company, Hartford, Conn., died May 15, 1933, aged 58 years.

Mr. Connors was a well-known electroplater, having been a member of the industry practicaly all his life. He was at one time an active member of the American Electroplaters' Society. According to C. B. Cook, vice-president and general manager of the Royal company, Mr. Connor was an outstanding man in the typewriter industry—progressive, efficient and very popular with all his associates.

After funeral services at Hartford, Mr. Connor was buried at Ansonia, Conn. He is survived by a daughter.

Edward L. Sturgis

Edward L. Sturgis of Medina, N. Y., a veteran metal manufacturer, died May 6, 1933, after a long illness. He had retired five years ago, after a breakdown in health. Mr. Sturgis was one of the founders of the Medina Iron and Brass Company, of which he was principal executive for many years. During his career he supervised the construction of some of the largest foundries in Western New York. At one time he was general superintendent of the Bignall Foundry Company. He also held that position with the Central Foundry Company for a time.

Mr. Sturgis is survived by four children.

Richard J. Findlan

Richard J. Findlan, secretary and treasurer of Aluminum Goods Manufacturing Company, Manitowoc, Wis., died April 22, 1933, aged 61 years. He started his career in the steel industry, then went to the Aluminum Company of America for 25 years. When the latter became interested in the Manitowoc concern in 1914, Mr. Findlan was transferred there as a staff executive.

News of Associations and Societies

Pewter Manufacturers

An agreement to eliminate piracy of designs in the manufacture of pewter ware was adopted at a meeting of the Pewter & Hollow Ware Manufacturers Association Wednesday, May 24th. This agreement will be part of a Code of Fair Competition to be drafted for submission to Washington, under the terms of the Industrial Control Bill. Flagrant copying of designs has always been followed by a cheapening of quality, the cutting of prices, and the reduction of wages and emploment, the Association believes.

The new code will provide for maintainance of fair price schedules; elimination of many unnecessary and slow-moving items from inventory; pooling a percentage of profits for protection of manufacturers who fall below their fair share of the business, as determined by a sales indicator; adoption of fair scale of wages and better hourly schedules.

A. Kadison, of Continental Silver Company, is the president of the Association, which has headquarters at 11 West 42nd Street, New York.

Connecticut Nonferrous Foundrymen's Association

At the meeting at Hotel Garde, New Haven, May 8, Walter M. Saunders, consulting chemist of Providence, R. I., gave an interesting illustrated lecture. Mr. Saunders was presented through the courtesy of C. E. Andrews of Whitehead Brothers Company.

This was the final meeting of the current year, and no further meetings will be held until October. The Association's address is Care of Secretary David Tamor, Reading, Pratt and Cady Company, Hartford, Conn. L. G. TARANTINO.

Metal Finding Association

Metal Finding Manufacturers Association, Providence, R. I., composed of Providence and Attleboro jewelry finding makers, elected officers in May, as follows: President, F. A. Ballou, Jr., of B. A. Ballou and Company; vice-president, F. G. Perry of George H. Fuller and Son Company; treasurer, William Whytock of Roland and Whytock Company; secretary, E. E. Baker of W. R. Cobb, Company.

Members who attended the annual meeting reported a general improvement in business conditions.

Ornamental Bronze Makers

The headquarters of the National Association of Ornamental Iron, Bronze and Wire Manufacturers have been moved from 1331 G Street, N. W., Washington, D. C., to 1772 Kessler Boulevard, South Bend, Ind.

Industrial and Financial News

Du Pont Buys Remington

E. I. du Pont de Nemours and Company, Inc., Wilmington, Del., has acquired control of Remington Arms Company, Inc., New York, for an undisclosed cash amount. Both companies are among the oldest makers of arms and ammunition, and have long done business with each other in explosives, and co-operated in research. Remington will be operated as a separate company, Hartley Dodge remaining board chairman.

Scovill Dividend Record

Scovill Manufacturing Company, Waterbury, Conn., has maintained dividend payments without interruption for 77 years. Present rate per share is $1 a year. At the recent annual meeting, H. O. Goss was continued as president. G. A. Goss, J. H. Goss, C. P. Goss, Jr., and Benet Bronson are vice-presidents; L. P. Sperry is treasurer; W. M. Goss is secretary.

New Lead Alloys

The British Nonferrous Metals Research Association recently introduced two new ternary lead alloys for use in building, known as B. N. F. lead alloys No. 1 and 2. No. 1 is formed by adding to the lead ¼% cadmium and ½% antimony; No. 2 is lead with ¼% cadmium and 1½% tin. The alloys were developed to overcome cracking in lead cable sheathings, due to vibration. Their vibration resistant qualities are said to make them highly useful in a number of other applications, including plant construction, pipe, etc.

Treasury Rules on Gold for Industrial Use

On May 1, the United States Treasury Department issued rules covering the purchase and sale of gold in and for the arts and industries. Persons or firms requiring gold may file applications with the Federal Reserve Bank in their district. Applications are made in duplicate, under oath, and must state amount of gold usually required for a 90-day period. A statement is also required that gold will be used only for legitimate business requirements. Records of users and dealers must be open to inspection. Strict and explicit rules have also been issued covering exportation of gold.

Foreign Metal Consumers

The United States Department of Commerce, Washington, D. C., has completed lists of importers and consumers of non-ferrous metals in England, Germany, France, the Netherlands, Italy and Japan.

The lists are comprehensive, classifying and identifying those firms dealing in new and scrap non-ferrous metals. There is a nominal charge of 50 cents for the list in each country, and copies can be obtained upon request to the Commercial Intelligence Division, Bureau of Foreign and Domestic Commerce.

Corporation Reports

Net profits, first 1933 quarter, with 1932 comparisons:

N. J. Zinc Co.; $437,378; against $591,104 profit.

Parker Rust Proof Co.: $55,887; against $82,900 profit.

Net losses for first quarter of 1933, with comparative figures for same 1932 period:

American Machine & Metals Co.; $368; against $113,789 loss.

American Metal Co., Ltd.: $313,573; against $240,044 loss.

American Type Founders: $781,678; against $645,000 loss.

Anaconda Wire & Cable Co.: $384,580; against $236,446 loss.

Baltimore Tube Co.: $33,614; against $52,084 loss.

General Cable Corp.: $976,978; against $850,169 loss.

International Silver Co.: $362,319; against $461,808 loss.

International Nickel of Canada: $80,158; against $536,071 profit.

Savage Arms Corp.: $120,574.

Chinese Aluminum Plant

South Manchurian R.R., Mukden, Manchuria, China, plans the construction of an aluminum plant at Fushun or Honkeiko, Manchuria. Experimental plant to cost $100,000 will be constructed first and used as basis of major project to cost $1,000,000. Address W. S. Dowd, Asst. Commercial Attache, Tokio, Japan, for further information.

Business Items—Verified

Foster D. Snell, Inc., chemists and engineers, have moved to 305 Washington Street, Brooklyn, N. Y. With larger quarters the firm now has a well integrated laboratory, with all facilities for research, development, pilot-plant work, testing and analysis, it is stated.

Aluminum Company of America and all subsidiaries now have offices in the Gulf Building, Pittsburgh, Pa., which the company moved on May 1. Subsidiaries are as follows: Alcoa Ore Company; Alton & Southern Railroad; Aluminum Cooking Utensil Company; Aluminum Seal Company; American Magnesium Corporation; Bauxite & Northern Railway Company; Carolina Aluminum Company; Franklin Fluorspar Company; Knoxville Power Company; Massena Terminal Railroad Company; Republic Mining and Manufacturing Company; St. Lawrence River Power Company; St. Louis and Ohio River Railroad Company, United States Aluminum Company.

Noma Electric Corporation, 524 Broadway, New York, maker of electric lighting equipment, will expand branch plant at Toronto, known as Noma Electric Company of Canada, Ltd. Will add 5,000 sq. ft. of space, and new equipment. Operates tool room, stamping and soldering departments.

Atlantic Zinc Works, Inc., has moved its sales and executive offices to 210 Van Brunt Street, Brooklyn, N. Y., where its rolling mill and finishing plant is located. The company specializes in "Zomo" electric zinc engravers' plates.

Homestead Valve Manufacturing Company, Inc., Coraopolis, Pa., has appointed **C. Kirk Hillman Company,** 3201 First Street, Seattle, Wash., exclusive Washington state representative for sale of "Hypressure Jenny" vapor spray equipment for industrial and automotive cleaning. Homestead company operates a nonferrous foundry and machine shop. **W. R. Schuchman** is president.

Fairmount Lamp Manufacturing Company, Sixth Street and Fairview Avenue, Philadelphia, Pa., has purchased a 4-story factory at 2021-29 Naudain Street, Philadelphia, for a new plant. Company operates spinning, soldering, plating, polishing, grinding, lacquering and japanning departments, and states it is in the market for new equipment.

Hesse and Gum Chemical Company has removed its office and plant to the new location at 113-115 36th Street, Union City, N. J.

Maas and Waldstein Company, Newark, N. J., lacquer manufacturers, have removed their Chicago, Ill., office and warehouse to 1336-38 Washington Boulevard. The new quarters at Chicago are considerably larger and will facilitate the company's expanding business in the territory, it is stated. **R. J. Hazucha** is in charge of the Chicago office as hitherto.

Lea Manufacturing Company, Waterbury, Conn., has been appointed Connecticut distributor of products of **Hanson-Van Winkle-Munning Company,** Matawan, N. J. According to **C. W. Yerger,** vice-president of H-V W-M, this is in line with the company's policy of supplementing its direct efforts by the appointment of territorial distributors such as Lea.

The Harshaw Chemical Company, Cleveland, Ohio, has removed its Pittsburgh, Pa., office to the Pennsylvania Railroad Building, Seventh and Carson Streets.

Worthington Pump and Machinery Corporation and **Gamon Meter Company** have consolidated operations in manufacture and sale of meters, through the newly organized **Worthington-Gamon Meter Company,** with sales headquarters at Harrison, N. J. All manufacturing will be concentrated in the Gamon plant in Newark, N. J.

Geuder, Paeschke and Frey Company, Milwaukee, Wis., manufacturer of stampings, enameled ware, etc., has acquired property of **Perfection Cooler Company,** Michigan City, Ind., and will continue at Milwaukee the manufacture of coolers and dispensers for beer. Company is also reopening steel beer barrel division. It operates tool room and spinning, stamping, zoncing, tinning, soldering, lacquering and japanning departments.

Doehler Die Casting Company has removed its main executive office to Toledo, Ohio, where the main Doehler plant is. President **H. H. Doehler** and vice-president-treasurer **F. J. Koegler** will make headquarters there. A New York sales office under management of L. H. Pillion, vice-president and eastern sales manager, has been retained at the old address, 386 Fourth Avenue, Rooms 1804-6.

R. Perlick Brass Company, Milwaukee, Wis., has removed its plant and offices to 1825 West St. Paul Avenue, where it will have 15,000 sq. ft. of floor. Company makes brewers' and bottlers' supplies, fittings and tapping equipment. It operates a brass machine shop, tool room, tinning, soldering, brazing, plating, polishing and lacquering departments. It formerly had 10,000 sq. ft. in the Pabst Brewery plant.

The Bristol Company, Waterbury, Conn., maker of indicating, recording and controlling instruments, announces that its New York office is now located in the Daily News Building, 220 East 42nd Street. Because of its central location and easy accessibility, this new office will enable the company still more efficiently to serve its clientele throughout the metropolitan territory. **C. W. Williamson,** district manager, continues in charge, assisted by a staff of six application and service engineers.

Pfaudler Company, Rochester, N. Y., reports a sharp pick-up in business in its products, glass-lined tanks and other equipment used in dairy, brewing and other industries. Although major part of business of Pfaudler Co. is with dairy industry, there has been a substantial improvement in volume of business from the brewing industry.
Add Business Items VERifieD.. .. ..

Boissier Electric Corporation, 100 Walker Street, New York, generator manufacturer and dealer in various finishing equipment and supplies, is the subject of a petition in bankruptcy filed in the Southern District of New York by Newark Brush Company, Fred A. Bohn and William Powell.

Alpha Metal and Rolling Mills, Inc., Brooklyn, N. Y., has opened a warehouse with full stocks of products at 344 Broome Street, New York, to insure immediate deliveries in Manhattan and surrounding territory. The company reports good demand for block tin pipe and air lead tubing.

Zinc Consumption for Electro-Galvanizing

Zinc consumption for electro-galvanizing (zinc plating) in 1932 was less than half what it was in 1931, according to the American Bureau of Metal Statistics. Reports received from 25 companies for 1932, compared with reports from 31 companies in 1931, are given below.

"In making this report," says the Bureau, "we are aware that our totals may be a little short of the actual, for although we receive reports from over 130 galvanizers, there are some omissions. Such omissions fall mainly under the heads of wire cloth and others. This does not impair the accuracy of the statistics for annual comparison, but in using them an allowance for a small minus error must be made."

Galvanized Products Output and Zinc Consumption Therein

(Production and consumption in tons of 2,000 pounds)

	1932			1931		
	Co.'s	Production	Zinc used	Co.'s	Production	Zinc used
Tubes	5	9,828	122	9	23,233	330
Wire Cloth	5	3,669	369	10	5,815	568
Other	16	....	608	19	....	1,728
			1,099			2,626

New Corporations

Aluminum Chrome Plate Corporation, South Bound Brook, N. J.; **Max Metch,** president; to carry on a general chromium plating business, specializing in aluminum and zinc base die castings.

Shawmut Automotive and Battery Manufacturing Company, Boston, Mass.; to manufacture auto storage batteries; will operate casting shop; by **Augustus J. Migell,** 17 Grant Place, Dorchester, Mass., and associates.

Eagle Metals Company, Seattle, Wash.; $5,000 capital; **William Anderson** and associates; to act as merchandising subsidiary of **Eagle Brass Foundry Company,** according to **L. P. Garrett.**

John F. Shea Company, Inc., 41 Hollingsworth Street, Mattapan, Boston; to convert and trade in tin, copper, steel and other metals; John F. Shea, president; Patrick T. MacQueeney, treasurer.

News From Metal Industry Correspondence

New England States

Waterbury, Connecticut

JUNE 1, 1933.

A decided improvement in local brass plants has taken place during the past month. **American Brass Company** has established a standard week of 40 hours, and some departments are working more than that. Previously, most departments worked much less. In a few departments men have been given one week off in four, but in most of them they have now been assured they will have steady work. The concern has also put on a few more men. **John A. Coe,** president, said three weeks ago that the concern had been getting more business in all departments. A week ago he said this trend has continued. Their immediate interest is to put more men to work by making 40 hours a week the maximum so far as possible.

Scovill Manufacturing Company has called back to work nearly 200 men during the past month. **Edward O. Goss,** president of Scovill, said two weeks ago: "Business has improved very considerably in the last three or four weeks, and is better than the seasonal increase. It pertains to practically every line of manufacture, both preparation of raw material and finished goods. I cannot say it is permanent, but it indicates deferred purchases. It does not look like a speculative movement."

The Chase Companies, Inc., report an increase in orders, engagement of more men and slightly longer hours. All the plants are attempting to make the maximum week 40 hours to put as many men to work as possible. **Frederick S. Chase,** president of Chase, says volume of business is showing a steady increase. **Rodney Chase,** assistant secretary, reports several more furnaces in the **Chase Metal Works** casting shop have been put in steady operation.

Plume and Atwood Manufacturing Company has speeded up most departments to 5½ days a week. Previously it was on a three-day schedule. It has also hired a few more men.

Patent Button Company has reported a steady increase in business and **Waterbury Buckle Company** has increased its time schedule and the number of its employes.

American Brass Company had an exhibit of its products at the New England Council Exposition in Boston last month.

The entire marine department of the **Waterbury Clock Company,** consisting of the manufacture of ship's bells, clocks, chronometers, barometers and desk sets has been sold to **E. J. Willis Company** of New York.

Beardsley and Wolcott Manufacturing Company, now in receivership, operated at a profit of $2,186 during the first month of its receivership, it was reported in the Superior Court here last week. The company at that time had $21,434 worth of orders on hand, and expected a $6,500 order. **James R. Sheldon,** president, was made permanent receiver. Claims against the firm must be filed within four months. Attorney Richardson Bronson, counsel for the receiver, said that to operate at a profit, orders amounting to $30,000 a month must be received. Indications point to profitable operation during May, he reported, as between the 1st and 4th more than $10,000 worth of merchandise orders were received.

Scovill, American Brass, Chase, and many smaller concerns have agreed once more to match, dollar for dollar, the contributions of their employees to the Mutual Aid Fund to provide work for the unemployed. Scovill, it is understood, has been contributing, and has agreed to contribute during the next year, considerably more than a sum equal to that contributed by its employees.

Many claims for "extra services" are being filed against the $1,300,000 estate of the late Frank Gorse, former assistant treasurer of Scovill. He left no will or any near relatives.

John H. Goss, vice-president of Scovill, speaking at the dinner of the Connecticut Conference of Social Workers here last month, said: "We [the manufacturers] think we can solve our problems better than they can be solved in Washington. If the anti-trust law is repealed industrial leaders will get together, and I think some sort of a minimum wage agreement and curtailment of working hours would be evolved. Once we evolve a program we would submit it for approval to some governmental agency, and it would become operative as soon as approved. We then would like to see a congressional commission set up to watch its workings, make recommendations and criticisms. By such a course we could finally work out a program that would be satisfactory." Fr. John Ryan, of Catholic University, Washington, differed sharply with him, saying:

"American industrialists must get it out of their heads that they can sit as judges on their own cases. They can't be impartial where their own interests are concerned. You can't trust any group of industrialists to run in the best public interest an industry which is producing profits. Satisfactory government in industry may be possible in a new social order, but government of any particular industry by the leaders of that industry will never be satisfactory."

Although **David L. Summey,** former engineer of Scovill, died several months ago, a patent has just been issued to him for a blocking machine. Other local patents issued last month are to **Henry G. Gros** of **Waterbury Tool Company,** for control apparatus for variable speed gears; to **Paul Lux** of the **Lux Clock Company,** for a combined alarm clock case and dial; **Forrest Purinton,** assignor to the **Patent Button Company,** for a traveling assembling device; **William Jacquiry,** for a machine for producing strip moldings; **Frank Zinno** for an apparatus for pouring molten metal; **Joseph Dante,** for an electric switch.

Scovill Manufacturing Company, according to a review by R. Schuyler Goodwin of Day, Stoddard & Williams, Inc., of New Haven, "by maintaining a strong financial position in connection with its efficient operating facilities, is now in a position to take full advantage of any upturn in business volume."

W. R. B.

Correction

In mentioning the exhibit of the Copper and Brass Research Association at the Chicago Fair in our April letter, several Connecticut companies were credited with co-operation in making the exhibit as fine as it is. Mention should also have been made of **Revere Copper and Brass, Inc.,** New York, and **Bridgeport Brass Company,** Bridgeport, Conn., who made important and distinctive contributions to the exhibit.

Connecticut Notes

JUNE 1, 1933.

BRIDGEPORT. — Remington Arms Company has announced that E. I. du Pont de Nemours Co. has purchased a controlling interest in the local concern. (See page 223.) Remington is operating on a five day schedule compared with three days previously.

Stockholders of the **American Chain Company,** which also has branch factories in Waterbury and Hartford, have been warned by letters from **Walter B. Lashar,** its president, against complying with requests of **Mark Wolff** and **Alexander White** for proxies to vote against the company's plan with respect to the 10-year sinking fund debentures which matured April 1. He writes that the issuance of new first mortgage bonds which would be exchanged for the past due debentures has already been sanctioned by holders of more than two-thirds of the common stock, while under the terms of the preferred stock its holders are not entitled to vote for or against the creation of first mortgage bonds.

Belknap Manufacturing Company has increased employment 25% to 30%, and is operating on full weekly schedule, due in part to large orders for a special bar faucet which was in demand before prohibition and is now being renewed. Orders have been received from all parts of the country, production has been built up to 250 faucets a day, and may be stepped up to 1,000.

Underwood-Elliot Fisher Company will resume production at its local plant, closed nearly a year since portable typewriter manufacturing was moved to Hartford. The production of the Underwood Sandstrand adding and bookkeeping machines and cash registers will take place here. The manufacturing equipment will be moved from Rockford, Ill.

HARTFORD. — Colt's Patent Fire Arms Manufacturing Company declared the regular quarterly dividend of 25 cents a share, payable June 10.

WINSTED.—Frank J. Hickey of Danbury has purchased the plant of the bankrupt **Polymet Manufacturing Company** from the Irving Trust Company, trustee, for a reputed $10,000. The plant originally cost $75,000. The trustees have agreed to pay the city $5,000 in taxes for 1930 to 1932. The trustees are seeking reductions in the taxes for those three years which total $144,151, besides interest. Previously the trustees allowed the **Belden Manufacturing Company,** Chicago, to remove 45 wire enameling machines from the plant in settlement of a claim against Polymet. Mr. Hickey, the new owner, expects to start operations soon with about 200 hands.

Gilbert Clock Company's receivership is expected to be removed soon. One plan involves public offering of 1,000 shares of stock, par value $100, at $10 a share, and purchase of 2,000 additional shares by officers and present stockholders. Another plan involves financing through sale of stock by a Boston bank. The company is now employing 300 workmen; under normal conditions it employs close to 1,000.

NEW BRITAIN.—A large steel one-story structure for forging operations will be erected soon by **Stanley Works** on Whiting Street, near the railroad siding of the company, to carry on the operations of the Newark, N. J., plant. Some of the workmen of that plant will be brought here. **Ernest W. Christ,** vice-president and secretary, confirmed this statement, and said about 150 workmen will be accommodated at the new plant. Stanley Works are putting out a new product, a line of materials for erection of miniature toy buildings, under the trade name of "Stanlo." The first public showing was at the toy buyers' fair at Chicago, May 1-13. Seven sets constitute the initial lien and sells for $1 to $10.

TORRINGTON.—The American Brass Company, Hendey Machine Co., and **Torrington Company** have increased working hours and taken on more help, an improved condition that officials expect will continue for several months. The American Brass casting shop is working 24 hours a day. At the Hendey shop between 50 and 70 old employes have been called back to work. In normal times it employed over 900, but recently only a skeleton crew has been kept there. The Torrington Company needle shop is now on a 40 hour weekly schedule, although previously it had been working as little as 24 hours a week.

NEW HAVEN.—Winchester Repeating Arms Company announces receipt of several more large orders for cartridges, jobbers now buying in anticipation of fall demands and before prices are advanced.

SHELTON.—Bridgeport interests are negotiating for the **Shelton Silver Cutlery Company** plant.

SOUTHINGTON.—The directors of **Southington Hardware Company** have voted a dividend of 25 cents a share on the common stock payable May 1.

THOMASTON.—Several departments of **Seth Thomas Clock Company** were temporarily closed last month, but officials denied it would be permanent. The case shop was closed for two weeks, and much of the office force were given two weeks' vacation. Officials state that orders are still coming in, and that business this year is better than last. No successor to the late Mason T. Adams, vice-president and acting head, has yet been named.

CLINTON.—The Day Manufacturing Company here was sold last month to **Felix, Michael** and **Anthony Fazzano,** recently engaged in automotive supplies sales in Hartford, and they soon sold it to **M. H. Young** of Springfield, Mass., who will operate it under the name of **the M. H. Young, Inc.** The plant specializes in making builders' tools, especially screw drivers. A contract now being filled calls for 15,000 of them immediately. W. R. B.

Providence, Rhode Island

JUNE 1, 1933.

Fredor Manufacturing Company, Inc., has been incorporated here to manufacture jewelry, authorized capital, 100 shares no par common stock, by **Philip V. Marcus, Fred Abrams** and **Ernest I. Dauer,** all of Providence.

Foster Jewelry Company has removed its plant to larger quarters at 80 Baker Street.

Since May 6 the members of the **Metal Finding Manufacturers' Association** have closed offices and factories Saturdays, and will continue so through August.

Mrs. Arline E. Durfee, first woman receiver ever named in this State, had a 100% record when she submitted her report on the affairs of the **Norton Latham Company, Inc.,** jobbers in sheet metals, 243 Richmond Street, whose home office is 66 Hudson Street, Jersey City, N. J. Mrs. Durfee, for the past three and one-half years ancillary receiver and bookkeeper in charge of the local office, stated in her report that she had collected $3,302.50, and that every creditor here would be paid 100 cents on the dollar. She had succeeded in sending back to the New Jersey office of the concern unsold goods to the value of $3,715.25. It cost her only $640.99 to operate the company during the receivership. After the payment of $500 for counsel and receiver fees, there was a balance of $752.48 to return to the company.

Acme Tool & Gauge Corporation has given a chattel mortgage for $6,500 to the National Bank of Commerce and Trust Company, Providence, on contents of plant at 121 Beacon Street, Pawtucket.

Arthur Hadley and **George Ingleby** of the **Hadley Manufacturing Company** returned May 15 from a 3,500-mile business trip through the Middle West and Canada by airplane. The trip took fifteen days, of which about 25 hours were actual flying time in a four-place plane with Ralph Bourbon, pilot. Hadley company has used transport planes extensively in previous business trips, but this was the first time its executives have chartered a plane to take them about the country. They flew from the Rhode Island State Airport at Hillsgrove to Buffalo, Toronto, Youngstown, O., Chicago, St. Louis, Kansas City, back to St. Louis, Cincinnati, Columbus, Pittsburgh, and home again. Having a chartered plane, they avoided all time losses. W. H. M.

Western Massachusetts

SPRINGFIELD, June 1, 1933.

Employment in the metal working concerns in western Massachusetts has increased considerably. A survey of the district reveals that in 26 metal industries nearly 500 more men are working

now than four weeks ago. A general pickup in business throughout the section has given employers a more encouraging outlook than they have had in many months.

Westinghouse refrigerator production has again been increased, and some operations are on a seven-day week basis. Sales since January 1 have shown a large gain over the same period last year. The force at the East Springfield works has been increased recently by 300 operatives; the number employed now is narly 2,500.

Perkins Machine and Gear Company, West Springfield, reports it is arriving at a profitable position, and that the outlook is best in more than a year. During the first two weeks of May the company received more orders than throughout April.

United American Bosch Company is increasing production and sales and placing more persons on the payroll, due to new lines. Plant officials report a vast improvement in business over last month. A new coil for higher speed cars is meeting with success. Sales to manufacturers and for replacement are on the increase. A new automobile radio set that has been put on the market is believed to hold great promise. Good orders are reported to have been booked for the unit and present plans call for the production of several thousand per month. Still another new Bosch product is a handy device for charging the battery of a car overnight by the simple method of plugging into a socket in the instrument board and leaving the device to do its own work. The engineering department of the establishment is running at a high pitch at present on various lines of development work. The plant in general is operating five days per week.

J. Stevens Arms Company division of **Savage Arms** will soon go into production with two new models that promise to sustain production volume in a season when it is ordinarily slack.

Springfield Foundry Company, Indian Orchard, has increased its operating schedule from five to six days a week and reports improved activity in numerous manufacturing lines coming to its attention within the last few days. In the demand for castings the pickup is found to be quite widely distributed over different industries and sections, and the increase in the number of inquiries looking to the manufacture of new products or improved models is said to be quite marked.

In Athol, Mass., the metal industry, which has been at nearly a standstill over a long period, shows a slight spurt, with increased orders for **Union Twist Drill Company,** makers of gears and cutters, and **L. S. Starrett Company,** tool producers. Although the new orders have not made it necessary to call back to work any considerable number of former employes, many of the workers are enjoying longer hours, with the prospect of the calling back to work some men who have been laid off temporarily. G. B. Y.

Middle Atlantic States

Trenton, New Jersey

JUNE 1, 1933.

John A. Roebling's Sons Company is preparing to begin work on the new Golden Gate bridge in California. The cables for the $5,855,000 contract will be drawn at the Roebling plant here, then shipped to California. Roebling will erect a subsidiary plant in California. Work on the new cables will insure added employment during the next four years. Wire and suspension ropes will be manufactured in Trenton by American Steel and Wire Company, whose plant manager, **R. C. Helm,** says it will take 20 months to fill the order. Actual production of the wire and rope will begin about July 1. About 400 men will be employed. Steel and rods will be manufactured at Worcester, Mass.

District sales managers of **Roller Bearing Company of America** gathered in Trenton for a four-day conference the latter part of May. **Edward C. Gainsborg,** service manager, presided.

C. A. L.

Newark, New Jersey

JUNE 1, 1933.

New Jersey Foundry Company has leased the one-story foundry type building at 300 Bergen Avenue, Harrison, N. J. The company manufactures brass, bronze and aluminum castings and plumbing supplies.

Paragon Manufacturing Company, for many years at 98 Murray Street, has leased a portion of the factory building on Hermon Street, for manufacture of automobile parts. The premises were formerly occupied by the **Western Electric Company.**

New Newark corporation: General Metal Manufacturing Co.; $225,000 capital; to manufacture metal beds.

Midland Tube and Pipe Company, formerly of Bordentown, N. J., has purchased the former plant of the **American Ball Engineering Company,** near Bound Brook. The concern will move there shortly, and will employ about 150 hands. The Midland concern manufactures seamless steel tubing for all types of mechanical uses and supplies many of the leading plumbing companies throughout the country. C. A. L.

Central New York

JUNE 1, 1933.

For the first time in more than three years smiles are noticeable on the faces of Central New York metal manufacturers as business in this area shows decided signs of picking up.

Bradford H. Divine, president of **Divine Brothers, Utica,** said that business with his company had increased distinctly. The company deals in supplies and equipment for the metal finishing trade. Mr. Divine said orders were coming in from all parts of the country. Two other Utica firms, **Foster Brothers Manufacturing Company** and **Brunner Manufacturing Company,** which use considerable quantities of non ferrous metal, are reported working on sizeable orders received recently.

Business is reported to be slightly better in the Rome area. **Chester Parson** of Rome was named executive secretary of the Oneida-Herkimer Association of Sheet Metal and Roofing contractors. Mr. Parson is engaged in the sheet metal business in Rome and will supervise co-operative buying for the dealers in Oneida and Herkimer Counties. The group is buying piping and metal in carload lots.

Settlement was announced in a $50,000 negligence suit brought by John and Mary Kiley of Hamilton, against Pierrepont B. Noyes, president of the **Oneida Community, Ltd.,** of Sherrill, and his son, Pierrepont T Noyes, for injuries suffered in a crash of cars last November. The plaintiffs settled for $8,000 to Kiley and $3,500 to his sister.

Business increases are reported in the Oneida area, where it is said orders are showing a marked increase at the **Oneida Community** silverware factories after a slow spring. **Maxwell Steel Vault Company** also reported better business.

Crawford C. Loomis of Ilion, has patented nine firearm improvements, and has been assigned patents to **Remington Arms Company. Adrian P. Roux,** Oriskany, has assigned a patent covering a method for making a new metallic composition in which he has incorporated seven new ideas, to **General Cable Corporation,** Rome.

Announcement was made late in May by M. Hartley Dodge, chairman of Remington Arms Company, Inc., that E. I. Dupont de Nemours Company of Wilmington, Del., has acquired Remington. (See page 223.)

Remington Typewriter Works, Ilion, has issued orders calling for a 40% increase in production. **R. E. Benner,** vice-president in charge of manufacturing, and **H. R. Russell,** general manager of the Powers Accounting Machine division of Remington-Rand, visited the Ilion plants and said the gain in booked business during May is very encouraging.

Reports for May will probably show better business for Remington-Rand than any month for more than a year. Messrs. Russell and Benner reported the U. S. Post Office, money order division, had placed one of the largest single orders for tabulating machines of recent years. E. K. B.

GOLD, SILVER and COPPER sunk in a British sloop of war in 1798 is being sought off Cape Henlopen, Del., by a syndicate of Long Island shipping men. Cargo is reputed to be worth $10,000,000.

Middle Western States

Detroit, Michigan

JUNE 1, 1933.

Improvement is noted in industrial conditions in the Detroit area. Automobile production is making some progress. Still, business generally is dragging and unsatisfactory and intensive effort will be necessary to make any real showing.

Payment of 40% of funds sequestered in the closed banks has aided materially in stimulating seasonal activities, but already these are beginning to show signs of receding.

Most of the motor plants are operating on materially curtailed bases. Retrenchments are noted in every department. Consolidations also are in evidence on every hand. Reports are current that some of the largest motor plants are contemplating closing outside assembly branches and concentrating all work at the main plants in Detroit.

Manufacture of refrigeration units is extensive in spite of depressed business conditions. The plants are operating nearly at capacity. This is probably the most active industry where non-ferrous metal is concerned, to be found anywhere in the middlewest. Furthermore, the future still seems to have something in store for it.

Plating plants are largely engaged on automobile parts, but none of them are producing anywhere near capacity. Manufacture of jewelry is exceedingly quiet, with very little improvement in sight.

A decidedly favorable outlook is seen for the **Bohn Aluminum and Brass Corporation,** in very improved sales, and advancing prices for its large holdings of metals. Sales in April made the biggest month since July, 1931. With motor companies expanding output in May and June, Bohn is now operating on increased schedules.

G. W. Mason, president of **Kelvinator Corporation,** says shipment of 30,116 units made April the biggest month in the company's 19 years. The figure is 47% over the April average for the last five years. The previous all-time record for a single month was April, 1932, with 25,427 units. "That this is not a temporary spurt is evidenced by the fact that we have on hand unfilled orders representing 217% of those on hand May 1," Mr. Mason said.

Wage and salary increases from 33⅓% for workers to 50% for executives, to offset reductions during the past year, were announced during the month by **Mueller Metals Company,** manufacturers of copper and brass fittings at Port Huron, Mich. **President O. B. Mueller** said a rush of orders has enabled the company to re-employ 175 workers during the last 30 days. It now has 600 workers and still is rehiring former employes.

Long Manufacturing Company, Detroit, formerly devoted to exclusive production of automobile radiators and clutches, is producing a new type of unit heater and cooling device, using copper instead of iron. F. J. H.

Cleveland, Ohio

JUNE 1, 1933.

Banking troubles the last month have reacted severely on business. Much money is tied up in closed banks, and no definite information is available as to when sequestered funds will be released. Furthermore, the amount eventually to be paid out is uncertain.

Production of automobile accessories showed a moderate stimulation a month ago, and work has continued along this line quite regularly. Nevertheless, spring activity in motor production already shows signs of tapering off.

The plating industry, closely allied with accessory manufacturing, is showing some activity, and this probably will continue to some extent as long as motor car manufacture remains active.

Aircraft contributed to industrial activity last month, but this only figures in a nominal way.

As in most Great Lakes industrial centers, it has been a struggle in Cleveland to maintain any sort of a showing in production.

Charles E. Thompson, president of **Thompson Products, Inc.,** reports April production of his company was 50% over March, and 80% of capacity. The increase came from many sources including aircraft, automotive and engine manufacturing industries.

A. G. Bean has been named board chairman of **White Motor Company,** succeeding A. R. Erskine, long identified prominently with Studebaker. Mr. Bean has been president of White for two years. F. J. H.

Chicago, Illinois

JUNE 1, 1933.

Indications of increased activity noted last month have materialized, and metal manufacturers are beginning to share in new orders from manufacturers of automobiles, farm machinery, hardware, and brewing and bar room equipment. The opening of the Century of Progress Exposition on May 27, and the revival of the brewing industry of which Chicago is the center are largely responsible.

A gain of 41% in April over April, 1932, is reported by **The Diamond T. Motor Car Company,** truck manufacturers. Fleets of trucks have lately been ordered by R. H. Macy, Sears, Roebuck, Atlas Brewing, Pie Bakers of America, and Liquid Carbonic.

Oliver Farm Equipment Company showed material improvement within the past few weeks, and **International Harvester Company** will start work soon on its new plant at East Moline which, when completed, will provide work for about 500 men.

Brunswick-Balke-Collender Company is finding real difficulty obtaining raw materials such as copper and brass in sufficient quantity to meet the present demand for fixtures, according to **B. E. Bensinger,** board chairman. Recently 500 additional workers were taken on, in addition to office workers in Chicago and branch houses, and the factory at Muskegon is operating night as well as day shifts.

J. R. Bohnen, secretary of the **American Washing Machine Manufacturers' Association,** stated here recently that factory sales for household washing machines in April totaled 54,184 units, an increase over 1932 figures for the fourth consecutive month.

Bastian-Blessing Company earned a net profit of approximately $40,000 in April, and from present indications will show a May net in excess of that, according to **Lewis G. Blessing,** president. Plant activity the past six weeks has increased from 80 part time workers to around 450 working overtime. Orders for beer pumps, beer cooling apparatus and tap room equipment are far in excess of the production capacity.

Borg-Warner Corporation has increased to a point restoring operations of the company to a profitable basis for the first time in 9 months.

Woodstock Typewriter Company sales for April showed an increase of 251 per cent over April, 1932, and a gain of 124 per cent over March, according to **R. W. Sears II,** president.

Bendix Aviation Corporation has been enjoying good business recently. In April there was a gain of 20% in volume over February and 40% over March. The increase has been in all lines; automotive parts and equipment as well as aviation equipment.

R. G. K.

Pacific States

Los Angeles, Calif.

JUNE 1, 1933.

John G. Ills and Company, 2902 19th Street, San Francisco, manufacturers of heavy duty kitchen equipment, have taken over the Pacific Coast sales department for **Malleable Steel Range Manufacturing Company,** South Bend, Ind.

Homer Baker, formerly of Russellville, Ark., has opened the Baker Welding Shop, 2432 El Cajon Boulevard, San Diego.

V. B. Anderson Company dealer in welding supplies, has moved to 120 Spurgeon Street, Santa Ana, Calif.

E. O. Massa has bought out his partner, **T. R. Lewis,** in the welding shop at 171 Paramount Avenue, Hynes, Calif., and has changed the name to **Pacific Welding Shop.**

Penguin Manufacturing Company, 30 Ninth Street, San Francisco, is making a new clothes cleaning and drying machine. **F. E. Snowden** is manager.

Schwab Machine and Welding Works, Ventura, Calif., has enlarged its plant.

Rockwood Sprinkler Company, Worcester, Mass., has opened Pacific Coast

headquarters and warehouse at 7 Front Street, San Francisco. **Al Fryer** is in charge.

Continental Can Company, 155 Montgomery Street, San Francisco, will spend $18,900 on warehouse improvements.

Falk Corporation, Milwaukee, has established a Pacific Coast branch at 7 Front Street, San Francisco, in charge of S. O. Ostrich Company.

National Rust Prevention and Water Proofing Company, Los Angeles, has opened an export office at 7 Front Street, San Francisco, in charge of Frazar and Company. Company makes rust preventives.

Leland and Haley, consulting engineers, San Francisco, are designing various air conditioning installations.

Wildberg Brothers Smelting and Refining Company has moved its Los Angeles plant to 635 South Hill Street, where there are larger facilities and modern equipment for precious metal smelting and refining. **Irving I. Wildberg** is president, and headquarters are at San Francisco. H. S.

Seattle, Washington

JUNE 1, 1933.

Eagle Brass Foundry, Seattle, turned out a greater volume of work the first five months of 1933 than in the same 1932 period, according to **William Anderson,** president. The plant has manufactured considerable material for bars, and is getting a share of brewing equipment business. This company has added machinery, including a fully equipped electric furnace department for production of nickel iron castings. This division has been placed under the direction of **Jim Paul,** for more than nineteen years in charge of foundry work for the Seattle-Astoria Iron Works, which is now re-named the Continental Can Company.

Legalized beer has acted as an impetus to the brass and copper industry [illegible] uget Sound country, believes **M. Rosen,** president-manager of the **Alaska Copper Works, Seattle,** whose company has benefited by orders for copper and brass equipment for use in Seattle brew plants. Mr. Rosen feels business in general is on the "up and up," and points out that his large factory is doing almost fifty per cent more business today than at this time in 1932. This is also true for the first five months of this year.

A pretty fair gauge of the business trend in Seattle is the volume of sales of the industries. The general feeling locally points to a steady rise.

Officials of the **Doran Company,** brass craftsmen, report the firm's business for the first five months of this year overshadow the volume of business in the previous five months by more than 25%. Doran receives annually the bulk of foundry business from Northwest paper and pulp mills, and a major share of the ship propeller sales on the Pacific Coast, being one of the West coast foundries equipped to handle the manufacture of large ship's propellers. Two well-known ocean-going liners required new propellers this spring due to marine accidents.

Although the company's business has not approached the par of normal times, the **Kazian Brass Foundry,** Seattle, reports a marked increase in production and sales the five months of 1933 as compared with the same period in 1932. The plant specializes in manufacture of brass, bronze and aluminum castings, ornamental metal work and statues. A number of orders for metallic garden ornaments and fire-place fixtures, together with a good share of foundry pieces, are the reasons for the "bright spot" in the firm's business. Business in "unusual' items proved a decided boost from a sales standpoint during the spring. Two silicon aluminum art fountains, 5 feet high and 5 feet in diameter were designed, cast and delivered to the Seattle Art Museum, a $300,000 structure presented in a bequest to the City of Seattle, to be formally opened early in June. The founts were of special design and have been placed in a conspicuous spot in the foreground of the exhibit grounds. H. B.

Metal Market Review

JUNE 1, 1933.

Activity in the metal industry during May was characterized by a considerable improvement in demand and a steady rise in prices. Most metals which are subject to fluctuation, excepting silver, touched the highest levels of the year on the final day of the month.

Copper

Opening the month at 6.75c, copper receded for a day or two the first week, then climbed to 7.00c, Conn. Valley basis for electrolytic, holding there until the final week, when it started to rise again, ending the month at 7.875c, the highest it has been in a long time. While inflation had something to do with this, there also was consumer demand. The brass mills were reported to be operating at from 42 to 60 per cent of capacity. A number of times during the month brass and copper fabricated products prices were advanced, in line with the metal. Another strengthening factor is the reduction in surplus stocks expected to occur through curtailed production and increasing shipments. Phelps Dodge announced early in May that it had cut its output in half, which meant it was producing only at 10 per cent of capacity. Domestic production of the country is said to be in the neighborhood of 15,000 tons a month now, or about one-half the figure for total domestic shipments.

Lead

Lead ended the month at 3.95c East St. Louis, the best price of the year, and longer. The month saw a further improvement in business, with consumers making purchases and inquiries quite steadily. It was calculated that sales for May shipment totaled 24,000 tons, with 22 000 tons already sold for June shipment, and some 11,000 tons for July. Corroders were reported the best buyers, generally, with battery manufacturers also taking metal. Some improvement in sales of mixed metals of lead base was also reported. While there was definite production curtailment, stocks at the end of April were larger by 2,650 tons than at end of previous month. May statistics are expected to show a decrease.

Zinc

Zinc held at around 3.75c East St. Louis the first half of May, then started an upward climb, ending the month at 4.35c. Production has been curtailed, and shipments are increasing, so that producers are in a fairly good frame of mind. Business last month was active, the brass industry taking a better amount of metal than theretofore. Galvanizers were also reported good buyers. The metal closed the month both active and strong, a condition it has been unable to boast in some time.

Tin

The final week of May saw more brisk trading in tin than had been seen in several years, and the price of Straits, N. Y. on May 31 went to 40.75c, after having hung between 32.375c, and 37.00c, most of the month. There has been a sustained demand for tin plating operations at steel mills, and also a considerable amount of the metal is said to be going into tubing and other apparatus used in connection with beer manufacture and dispensing.

Other Metals

Aluminum remained unchanged in price, the basic level for 99 per cent mill ingot holding at 23.30c per pound.

Antimony showed the smallest price gain of any of the fluctuating metals last month, going up to 6.35c May 31, after holding at 6.25c most of the month.

Precious Metals—Contrary to the trend in other metals, silver ended the month at a somewhat lower price than it brought on May 1. Liquidation by speculative traders caused a weakening during the month, but at the close the tendency was firm again.

Platinum held throughout the month at $29.

Rules have been issued by the Treasury covering the purchase and sale of industrial gold. See page 223.

Scrap Metals — Activity in scrap metals was closely akin to that in the virgin metal markets. There were steady price advances as the general virgin trend went upward, and demand was better on the rising quotations.

Unfilled brass ingot orders were larger on May 1 than at the beginning of the preceding month, and prices paid during the latest month reported by the Institute were higher, as shown in the table below. April deliveries were also larger.

A complete list of prices of scrap metals is given on page 231.

Brass Ingot Statistics

On May 1, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Insitute, Chicago, Ill., amounted to a total of 16,408 net tons, as compared with 15,591 tons on April 1.

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for April amounted to 2,274 tons, as compared with 1,586 tons in March.

Average prices per pound received by the Institute members on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending May 19, 1933, are as follows, with comparative prices, reported for the period ended April 21:

	28 Days Ended	
Commercial 80-10-10	May 19	April 21
(% Impurities)	7.299c	6.258c
Commercial 78%	5.902c	4.578c
Commercial 81%	6.034c	4.948c
Commercial 83%	6.278c	5.281c
Commercial 85-5-5-5...	6.538c	5.722c
Com. No. 1 yellow.....	5.262c	4.393c

The Wrought Metal Market

JUNE 1, 1933.

Further advances were made in prices of fabricated copper and brass products last month. On May 8 the leading producers raised the levels ¼c a pound throughout the list, and on May 16 increases ranging from ⅛c to 1c a pound were announced on all items except rivets, burs and yellow brass seamless tubes. Still another advance in the whole list was made on May 31. The latest prices are shown on the next page.

The higher prices resulted, of course, from the general advance in commodity levels, which in turn was a consequence of inflationary moves in Washington as well as a noticeable improvement in business.

Manufacturers in the various metal fabricating centers last month reported a marked upswing in orders, and production was stimulated in accordance. Especially encouraging were reports from the Connecticut Valley and other New England manufacturing areas of increased business and employment. Electrical and automotive production are among the busiest divisions, but many other lines have felt the betterment too.

It is still difficult to estimate just what the newly revived brewing industry holds out for the metals, but some business has nevertheless developed, while more is in prospect. Aluminum vats have been ordered for trial by a Milwaukee brewery, to be made at Maryville, Tenn.

Another aluminum development is reported in connection with establishment of the Virginia Airship Company at Richmond, Va., which plans to build a new type of rigid lighter-than-air ship. Still another is the building of an aluminum Pullman car for display at the Chicago fair, later to be tried out on the rails by the Pullman Company.

Thirty-two manufacturers, believed to represent about 75 per cent of the die casting industry, reported to the American Bureau of Metal Statistics the following consumption of metals for 1932. The figures represent metal content of all alloys used, without segregation of zinc base, aluminum base, etc. Comparative 1931 figures are given.

Metals Used in Die Castings

(In tons of 2,000 pounds.)

	1931	1932
Zinc	15,153	12,227
Aluminum	3,414	2,575
Copper	740	560
Lead	195	99
Tin	194	108
Antimony	75	9
Other metals	151	126
Totals	19,922	15,704

Under "other metals" are included silicon, magnesium, and nickel.

Daily Metal Prices for May, 1933

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16	17
Copper c/lo. Duty 4c/lb.													
Lake (Del. Conn.)	6.75	6.75	6.625	6.625	6.75	6.75	6.75	6.75	6.75	7.00	7.00	7.00	7.00
Electrolytic (Conn.)	6.625	6.625	6.50	6.50	6.75	6.75	6.625	6.625	6.75	7.00	7.00	7.00	7.00
Casting (f.o.b. ref.)	6.375	6.375	6.25	6.25	6.50	6.50	6.50	6.50	6.50	6.75	6.75	6.75	6.75
Zinc (f.o.b. East St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.75	3.75	3.70	3.70	3.70	3.75	3.75	3.70	3.75	3.75	3.75	3.75	3.75
Brass Special	3.80	3.80	3.75	3.75	3.75	3.80	3.80	3.75	3.80	3.80	3.80	3.80	3.80
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	32.375	32.375	32.75	33.625	34.625	36.00	36.00	36.00	36.875	36.75	35.65	35.75	36.25
Pig 99%	30.375	30.25	30.50	31.125	32.00	32.75	32.625	32.625	33.25	33.25	32.20	32.375	32.75
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.375	3.375	3.375	3.375	3.375	3.525	3.525	3.525	3.525	3.525	3.525	3.525	3.525
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Electrolytic 99.9%	35	35	35	35	25	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Silver. c/oz. Troy Duty Free	36.25	35.50	35.125	34.625	35.25	35.375	34.625	34.25	34.50	33.875	32.125	32.375	33.125
Platinum $/oz. Troy Duty Free	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00

	18	19	22	23	24	25	26	29	30*	31	High	Low	Aver.
Copper c/lb. Duty 4c/lb.													
Lake (Del. Conn.)	7.00	7.00	7.00	7.00	7.00	7.375	7.375	7.625	....	7.875	7.875	6.625	6.989
Electrolytic (Conn.)	7.00	7.00	6.75	6.875	6.875	7.00	7.25	7.50	....	7.75	7.75	6.50	6.898
Casting (f.o.b. ref.)	6.75	6.75	6.75	6.75	6.75	7.00	7.00	7.25	....	7.50	7.50	6.25	6.693
Zinc (f.o.b. East St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.75	3.75	3.75	3.80	3.85	3.90	4.00	4.25	....	4.35	4.35	3.70	3.816
Brass Special	3.80	3.80	3.80	3.85	3.90	3.95	4.05	4.30	....	4.40	4.40	3.75	3.866
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	36.70	36.00	35.50	36.00	37.00	37.00	36.875	39.125	....	40.75	40.75	32.375	35.908
Pig 99%	33.125	32.625	32.00	32.50	33.50	33.50	33.50	35.625	....	37.125	37.125	30.25	32.708
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.525	3.525	3.525	3.525	3.525	3.60	3.60	3.75	....	3.95	3.95	3.375	3.527
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	....	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Electrolytic 99.9%	35	35	35	35	35	35	35	35	....	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	....	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	....	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	....	6.35	6.35	6.25	6.255
Silver c/oz. Troy Duty Free	32.50	33.125	33.375	33.375	33.625	33.50	33.25	34.50	....	35.125	36.25	32.125	34.063
Platinum $/oz. Troy Duty Free	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	....	29.00	29.00	29.00	29.00

* Holiday.

Metal Prices, June 6, 1933

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 8.00. Electrolytic, 8.00. Casting, 7.75.
Zinc: Prime Western, 4.35. Brass Special, 4.40.
Tin: Straits, 42.25. Pig, 99%, 38.75.
Lead: 3.95. Aluminum, 23.30. Antimony, 6.50.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: Flask, 75 lbs., $60. **Bismuth,** 85.
Cadmium, 55. **Silver,** Troy oz., official price, N. Y., June 7, 35.75.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $22 to $24.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2¼c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U. S. Duty	Import Tax*
Brass Ingots, Yellow	5¾ to 7½	None	4c. lb.[1]
Brass Ingots, Red	7 to10	do	do
Bronze Ingots	7 to12	do	do
Aluminum Casting Alloys	9¼to14	4c. lb.	None
Manganese Bronze Castings	19 to32	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	24 to36	do	do
Manganese Bronze Ingots	8½to11	do	4c. lb.[1]
Manganese Copper, 30%	11½to16	25% a. v.	3c. lb.[2]
Monel Metal Shot or Block	.. 28	do	None
Phosphor Bronze Ingots	8½to11	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	11½to16	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	10½to15	do	do
Phosphor Tin, no guarantee	44 to60	None	None
Silicon Copper, 10%	18 to30	45% a. v.	4c. lb.[1]
Iridium Platinum, 5%	$29.50	None	None
Iridium Platinum, 10%	$30.50	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	5⅛to 5⅜	Free	4c. per pound on copper content.
Light copper	4¼to 4½	Free	
Heavy yellow brass	2⅞to 3⅛	Free	
Light brass	2¼to 2½	Free	
No. 1 composition	3⅞to 4⅛	Free	
Composition turnings	3⅝to 3⅞	Free	
Heavy soft lead	2¾to 3	2⅛c. lb.	None.
Old zinc	1½to 1¾	1½c. lb.	
New zinc clips	2 to 2¼	1½c. lb.	
Aluminum clips (new, soft)	12½to13½	4c. lb.	
Scrap aluminum, cast, mixed	5½to 6	4c. lb.	
Aluminum borings—turnings	3½to 4½	4c. lb.	
No. 1 pewter	19 to20	Free	
Electrotype or stereotype	2⅜to 2⅝	2⅛c. lb.*	
Nickel anodes	24 to26	10%	
Nickel clips and turnings	19 to28	10%	
Monel scrap	9 to11¾	10% a. v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added **extras** for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective June 1, 1933.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	15⅜c.	2½c. lb.
Bare wire, soft, less than carloads	10½to11c.	25% a. v.
Seamless tubing	14⅞c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	21¾c.	10% Quality	24⅝c.
15% Quality	23⅞c.	15% Quality	29c.
18% Quality	25⅛c.	18% Quality	32¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (June 7) 38.75c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

BRASS AND BRONZE MATERIAL

Net base prices per pound, mill shipments.

	High Brass	Low Brass	Bronze	Duty	U. S. Import Tax
Sheet	13⅛c.	14⅜c.	14¾c.	4c. lb.	4c. lb on copper content
Wire	13⅛c.	14⅜c.	14¾c.	25%	
Rod	10⅝c.	14⅛c.	14½c.	4c. lb.	
Angles, channels	21⅛c.		22¾c.	12c. lb.	
Seamless tubing	14¾c.		16½c.	8c. lb.	
Open seam tubing	21⅛c.		22¾c.	20% a.v.	No tax.

TOBIN BRONZE AND MUNTZ METAL

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	14¾c.
Muntz or Yellow Rectangular and other sheathing	15¼c.
Muntz or Yellow Metal Rod	11⅝c.

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	7.50	2⅜c. lb.
Cut Lead Sheet (base price)	7.75	2⅜c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, June 6, 1933

ANODES

Copper: Cast	15c. per lb.	**Nickel:** 90-92%	42c. to 46c. per lb.
Rolled, sheets, trimmed	14c. per lb.	95-97%	43c. to 47c. per lb.
Rolled, oval	13¾c. per lb.	99% cast, 45c. to 49c.; rolled, depolarized, 46c. to 50c.	
Brass: Cast	14¾c. per lb.	**Silver:** Rolled silver anodes .999 fine were quoted June 7 from 38.75c., per Troy ounce upward, depending upon quantity.	
Zinc: Cast	9½c. per lb.		

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.85/lb.	$2.55/lb.	$2.35/lb.
10-12-14 & 16	2 to 3½	2.75	2.45	2.25
6-8 & over 16	1 to 2	2.95	2.65	2.45
6-8 & over 16	2 to 3½	2.90	2.60	2.35
6 to 24	Under ½	4.15	3.85	3.65
6 to 24	½ to 1	3.85	3.55	3.35
6 to 24	Over 3½	3.25	2.95	2.75

Any Quantity

4 to 6	Under ½, $4.90	½-1, $4.75	1 to 3, $4.65
1½ to 4	" 5.45	" 5.30	" 5.25
1 to ½	" 5.75	" 5.60	" 5.50

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick.
On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less:

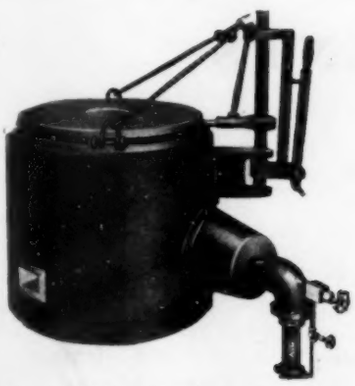
11" 20 ply 64/68 Unbleached	$16.60 to 21.40
14" 20 ply 64/68 Unbleached	27.40 to 35.80
11" 20 ply 80/92 Unbleached	18.30 to 22.88
14" 20 ply 80/92 Unbleached	30.66 to 42.05
11" 20 ply 84/92 Unbleached	25.95 to 30.43
14" 20 ply 84/92 Unbleached	43.43 to 53.79
Sewed Pieced Buffs, per lb., bleached	30c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.08-.09½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.11½-.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08-.12
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.095-.11
Denatured drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.12
Chrome Green, bbls.	lb.	.18
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.20
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	2.75-5.25
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluorspar, bags	lb.	.03½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead—Acetate (Sugar of Lead)	lb.	.09-.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry, bbls.	lb.	.32
Chloride, bbls.	lb.	.16-.21
Salts, single, 300 lb. bbls.	lb.	.11-.13
Salts, double, 425 lb. bbls.	lb.	.11-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium—Bichromate, casks (crystals)	lb.	.08
Carbonate, 96-98%	lb.	.06⅝
Cyanide, 165 lbs. cases, 94-96%	lb.	.50
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.05½
Silver—Chloride, dry, 100 oz. lots; Cyanide (fluctuating); Nitrate 100 ounce lots		Prices subject to rapid fluctuations of silver market.
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF.BeF_2$)	lb.	4.30-7.00
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	.03-.04
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, fluctuating	lb.	.25
Sulphocyanide	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, fluctuating, 100 lb. kegs	lb.	.33-.33½
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½

MONARCH FURNACES



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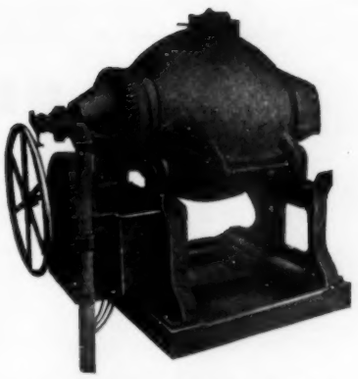

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